THE ENGINEERING AND MINING JOURNAL
MINING AND METALLURGY ESTABLISHED 1865

VOL. LXXIX No. 17.

PUBLISHED EVERY THURSDAY
505 PEARL STREET, NEW YORK.

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TELEPHONE 6167 FRANKLIN. P. O. BOX 1833
CABLE ADDRESS, "ENGMINJOUR" NEW YORK.

BRANCH OFFICES.

CHICAGO.....520 Monadnock Block
DENVER.....206 Boston Building
SALT LAKE CITY.....1529 Second East St.
BUTTE, MONTANA.....19 & 20 Owsley Block
SAN FRANCISCO.....168 Crocker Building
LONDON, ENGLAND.....20 Bucklersbury, E. C.

*Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Canada, Mexico, Cuba, Porto Rico, Hawaii or the Philippines.*

*To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 32 marks; or 40 francs. Notice to discontinue should be written to the New York office in every instance.*

*Advertising copy should reach New York Office by Monday morning of issue week; changes of copy by the preceding Thursday.*

*Copies are on sale at the news-stands of the following hotels:—Waldorf-Astoria, New York; Brown Palace, Denver; Palace Hotel, San Francisco, and the leading hotels in the principal cities.*

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THE ENGINEERING AND MINING JOURNAL.

Entered at New York Post Office as mail matter of the second class.

## CONTENTS.

Editorials:
Notes. . . . 809
Hoisted by His Own Petard. . . . 810
Tricks that Are Vain. . . . 811
Copper Production of the World. . . . 811
Market Conditions . . . . 812
Discussion:
The Mining Law. . . . *E. R. True* 813
The Iodimetric Determination of Copper, *Thorn Smith* 813
Marking Samples. . . . *W. G. Swart* 814
Mining Engineering at Oxford and Cambridge . . . . *Oxonian* 814
Cost of Mining Anthracite. . . . 793
The Girard Estate Collieries. . . . 793
The Iron and Steel Institute. . . . 793
*Types of Coal Mine Cars. . . . *R. V. Norris* 794
Cost of Chlorinating Cripple Creek Ores, *Occasional Correspondent* 795
A Proposed Amendment of the Mineral Land Laws. . . . *Geo. A. Packard* 796
Metasomatic Replacement. . . . *James Park* 799
*The Yankee Girl Orebody. . . . *T. E. Schwarz* 800
International Petroleum Congress. . . . 801
Ammonia Cyanidation of Copper *A. Farman* and *E. Le Gay Brereton* 802
Winding Rope with too High an Initial Factor of Safety . . . . 803
*Cost of Mining and Milling. . . . *R. J. Grant* 804
British Engineering . . . . 805
Books Reviewed. . . . 806
Books Received . . . . 807
Russian Metal Production. . . . 808
Shipping Sizes of Anthracite. . . . 808
Correspondence:
Another Warning. . . . *R. W. Raymond* 808
The Metric System in Mexico, *Ferdinand Sustersic* 808
Bruno Kerl. . . . *R. W. Raymond* 812
New Operations in the Connellsville Region. . . . 815
Questions and Answers . . . . 825
Recent Legal Decisions. . . . 825
Abstracts of Official Reports:
Rio Tinto Company, Ltd. . . . 825
Isle Royale Copper Company. . . . 826
*A Gasoline-Driven Rock-Drill. . . . 827
*The Zanner Pans. . . . *W. R. Ingalls* 828
Patents Relating to Mining and Metallurgy:
*United States . . . . 829
Great Britain . . . . 830
**Illustrated.*

## DEPARTMENTS.

Assessments . . . . 822
Chemicals and Minerals:
New York . . . . 819
Foreign . . . . 820
Coal Markets:
United States . . . . 816
Foreign . . . . 817
Dividends . . . . 822
Financial Notes:
Gold and Silver Movement. . . . 811
Industrial Notes. . . . 836
Iron and Steel Market:
United States . . . . 817
Foreign . . . . 818
Metal Markets:
Silver . . . . 821
Copper, Tin, Lead, Spelter, and Minor Metals . . . . 821, 822
Mining News:
Summaries—Butte, Deadwood, Denver, Duluth, Houghton, Leadville, San Francisco, Scranton, Johannesburg, London, Mexico, Sydney, Toronto, Victoria. . . . . 830
United States . . . . 837
Foreign . . . . 839
Mining Stocks:
Market Reviews . . . . 816
Quotations . . . . 823, 824
Obituary . . . . 835
Personals. . . . 835
Societies and Technical Schools. . . . 835
Trade Catalogues . . . . 836

## EDITORIAL.

AS THE FINANCIAL center of the country, New York is losing dignity. A few months ago Mr. Lawson's pyrotechnics caused a panic, and now the gambling of Mr. Gates has been sufficient to unsettle the metropolitan money market. Episodes such as these indicate that our Stock Exchange is no national register of values; it is provincial. The absence of stability and the sensitiveness to the doings of irresponsible buccaneers emphasizes the fact that New York is still a local bucket-shop compared to London, Paris or Berlin. It will remain so, until the big men adopt a code better than that of the faro dealer.

NOTWITHSTANDING THE depressed condition of the coal mining industry in the block coal district, and in some other districts of Indiana, there is a contest going on over the control of the coal lands opened up by the building of the new Indiana Southern road. Two Chicago interests are trying to secure the coal, and their rivalry has led to the paying of high prices for some large tracts of undeveloped coal land. To what extent these lands will be opened is uncertain; probably a part will be held in reserve for some time to come.

GOLD MINING on a considerable scale is to be tried in Indiana, a syndicate of Indianapolis business men having bought a tract of 640 acres in Morgan county, where appliances for washing the gravel are to be put up. The supply of water is abundant. For many years there have been reports of the finding of gold in the streambeds of that part of the State; and small quantities have been panned out in several places. The present venture, however, is the first attempt to work the supposed placer ground in a systematic way. The State Geological Survey, from time to time, has noted the finding of gold in small quantities.

THE CURRENT number of *Le Génie Civil* gives a well illustrated description of the grounds, buildings, and equipment of the universal exposition to be held at Liège, Belgium, in the coming summer months. This JOURNAL has already given friendly notice to this undertaking; and while the exhibition may not rival those of Paris, Chicago, or St. Louis in area or display, yet the old cathedral city has much to en-

tice the traveler of taste. Her museum, her school of mines, her factories of arms and implements, her neighborhood to Seraing, all invite the stranger to an exhibit the setting of which will be worthy of the arts displayed.

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THE PAPER ON the ammonia-cyanidation of copper, appearing in another column, will attract attention to a subject which was quite thoroughly considered by this JOURNAL, from the practical side, some years ago. All cyanide workers will welcome any help in understanding and applying the method, so well outlined by Mr. Bertram Hunt and described by L. Janin, Jr., at that time.

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OUR LONDON contemporary *The Mining Journal*, published recently an account of the effort to recognize mining engineering at the two leading English universities. On another page, an Oxonian regrets the want of a proper training in the days gone-by, and expresses the hope that the grafting of technology on the classical tree will result in a fruit of commercial usefulness. This seems only a compromise likely to make for confusion. The Royal School of Mines now existing should be given an endowment and equipment equal to its noble traditions and to the usefulness of the men whom it has graduated; let there be one institution where the youth of the Empire can acquire the fundaments of their training for mining engineering; and in the meantime let Oxford and Cambridge stick to their last, as the great teachers of classical and mathmematical education, and the cradles of philosophic thought. At a time when the historic School of Mines is being starved out of existence through lack of endowment, and seems likely to be smothered under the incubus of a mushroom institution, such as London University, it does seem as if the training of Englishmen for the profession of mining engineer were drifting between the Scylla of the amateur and the Charybdis of the bureaucrat.

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THE HIGH PRICE of copper is stimulating the re-opening of abandoned copper mines. Among the most famous of them is the Burra Burra in South Australia. From its start, in 1845, to the end of its thirty years of activity, this mine produced 234,648 tons of ore, yielding 51,622 tons of copper valued at £4,749,224, with dividends amounting to £826,585. It was closed down, owing to impoverishment of the lode, before a depth of 300 ft. had been attained and while still above the sulphide zone. A heavy influx of water has hitherto restrained any attempt at resumption of work.

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## Hoisted by His Own Petard.

A spasm of exactitude has swept across the mining world; 'ore reserves' has become a term of dreaded import; the young men have armed themselves with a boomerang and the old hands have been astonished into silence. The campaign for method in sampling, for conscience in estimating, and science in the final appraisal of mines has succeeded beyond our expectation. Transmission of ideas has been helped by the technical literature of the profession, and now, like the undertow that meets the oncoming surf, we are receiving the backward wave of a discussion that has spent its force for good. We are threatened with virtues that have been exaggerated to vices, and with methods that have been debased to a fetich. The whole question of ore reserves has become a state of mind; there is a palsy on judgment, an eclipse of experience.

The mining engineer, who once used his brains with cheerful confidence to formulate clear opinions regarding the condition of a mine, now stands panic-stricken on the edge of a difficulty from which he cannot retreat. From emphasizing the care required in determining the commercial value of ore, from the demand that the old happy-go-lucky style of inspection shall no longer be tolerated, from these and other efforts to ally science with experience, we have passed to that stage where engineers state tonnages with fearsome minuteness and quibble over assays of academic difference, until the last stroke of all is the suggestion, in South Africa, to "audit ore reserves" and appoint a government-certificated-ore-reserve-auditor! In truth, it is time to pull up. West Australian mining has been suffering from this intoxication of theory until it is recognized that each estimate of the ore blocked out in a mine must be more conservative than the last. A variation which is no real difference becomes a discrepancy; a capable engineer's work is stultified by that of another equally capable, simply because the two of them do not sing a perfect duet of appraisal, and shareholders tremble every time a cablegram comes from the mine manager. It has gone so far that the general condition of a mine, the metallurgical treatment of the ore, the excellence of management, are of no avail when weighed against the estimate of the ore in reserve; indeed, one could maintain the shares of a mining company at a big premium without producing an ounce of gold or paying a penny of dividend, if only at stated intervals some engineer would certify that the ore reserves had increased. In South Africa the samplers almost loom bigger than the consulting engineers, and in America the English-owned mines which are suffering from the same miasma are described by their engineers in terms which are so cautious that, whether twice as much or half the amount of ore stated should be extracted, no censure would be possible. In the old days they guessed twice and divided by two for accuracy's sake; nowadays the engineer, more solicitous for his own reputation than his client's welfare, hedges with providence and divides by two, so as to be safe. Mining is being made ridiculous; there is an idea that risk can be eliminated, that shareholders can insist on supernatural closeness of calculation, that engineers must save their skins and that everyone must "get out from under" when an orebody happens to misbehave.

And in all this, have we not lost the main point of mining—what the old Cornish Captains would call the 'sport' of it—the exercise of experienced judgment in sizing up the present character and future prospects of a mine? No, forsooth! We no longer buy a mine for the chance of favorable development, the making of a mine out of a prospect, or a bonanza out of a struggling hole-in-the-ground; we take no risks, we buy *ore*. As if by all the measuring and assaying and arithmetic we can eliminate the essential risk of estimating what we do not see, save at its edges. Sample and survey and calculate all you please, and then, even if you face the facts like a man and do not play tricks to avoid responsibility, you still have only one-half—sometimes not even one-half—of the essential problem. The future prospects of a mine remain beyond the vision of a timid *doctrinaire;* to gauge them fairly needs the ability to observe beyond the point of the pick, and the honesty to weigh facts, to an extent far beyond the shifting compromise of a conservative ore-reserver. It is time to get back to bedrock.

### Tricks That Are Vain.

Reference was made recently, in these columns, to the system under which English mining companies pay for the reports of their meetings, as published in the financial journals of London. This practice is accompanied by other methods, the description of which will interest our American readers, even if it fails to spur our English friends to remedy the evil. It is a fact that cablegrams, weekly reports and similar announcements covering the operation of mines, are paid for at an average rate of half-a-crown, that is sixty cents, per line. Moreover, in order to have the share quotation of a company included in the tabulated statement appearing in the daily financial papers it is necessary to pay as much as £100 per annum. A certain corporation controlling half a dozen mines in a single district pays for this attention at the rate of £50 for each company. Of course, the big mines have their names inserted without payment, because the dealings in their shares constitute important news; but lesser concerns and young mines make such arrangements as described. By comparing the lists printed by different papers, it will be found that they vary. If you own shares in certain mines, you buy that particular daily paper which makes a specialty—at so much per annum—of giving the quotations in which you are interested. If such an arrangement is made, you find reference to the mine in the market letter; a slight rise is magnified, a slight fall is minimized; if the closing price goes up threepence, the comment is that "the market was strong," there was "a good undercurrent," "the bears have been driven to cover," and so forth; but if your subvention has been omitted, the gentleman who scribbles will say that the market in that particular share "lacked support," there is "a weak bull position," there was "a sharp relapse," and other phrases calculated to make the investor shiver. Some papers chronicle a rise where others show a fall; here also a *douceur* may explain the difference. Of course, the Stock Exchange record is published in most of the financial dailies, but not in the weekly papers; apart from this, there is trading in a large number of shares not listed on the Stock Exchange, and, even as regards those which find record there, the effect of comment on the turns of the market is such as to prompt acquiescence in the subsidizing of the press. To those bringing out new companies, and especially to promoters who lack the support of heavy financial interests, this system is an iniquitous tax. We know that a company which floated an American mine in London paid the editor of one financial daily not less than $15,000 during the course of twelve months, nominally for publishing the prospectus and the reports on the mine, but actually for favorable comment, and an occasional endorsement of the enterprise. It comes to this, that the accounts of meetings and the insertion of cabled reports from the mine, of weekly letters from the manager, and even of the share quotations, are all paid for; and though the space for this matter is purchased as much as that given to advertisements, it is sandwiched between editorial comment and other supposedly unprejudiced reading matter until one is indistinguishable from the other in appearance, as they are in fact. Through such a quagmire the English investor treads his way. The oracular utterances of a press, every member of which is besmirched with the mud of this financial morass, lose all their dignity. No effort to distinguish between the respectable and the disreputable papers can obscure the fact that all of them, while posing as guides to public opinion, are being squared no less surely than the man who closes his hand over a bribe. In China they call it 'squeezing.'

### Copper Production of the World.

The most comprehensive record of copper production which is attainable at the present time is a statement prepared by Messrs. Henry R. Merton & Company, of London. An experience of many years has enabled them to estimate, with a close approach to accuracy, the output of the mines of those countries where official returns are not attainable, which is the case in all of the South American countries and in a few in Europe. The totals which are given in this statement show that the increase in the production of copper last year was not large, the total gain having been 38,385 tons, or only 6.7 per cent, as compared with 1903. The average increase for a number of years prior to 1903 was about 8 per cent yearly; but for two years past the gain has been comparatively slow. This fact, coupled with a continued advance in the consumption of the metal, is quite sufficient to account for the increasing range of prices which we have recently seen, and to incline the observer to believe that this increase is, to a considerable extent, of a permanent nature. We do not mean to say that there will be no decline at all in prices from the present quotations, but it is altogether probable that we shall not for a long time see any return to the nine-cent, or even eleven-cent copper of a few years ago.

The increase which we refer to above came almost entirely from the mines of North America. There was some gain in Australasia and in Japan, while the mines of South Africa recovered fully from the injuries inflicted on them during the Boer War; but it is the North American mines which showed the principal advance. Our continent furnishes about two-thirds of the copper supplies of the world, and the United States alone about 55 per cent of those supplies. There is no prospect that this pre-eminence in production will pass away.

In the following table we give the figures from Messrs. Merton's circular; they are in long tons of 2,240 lb. each:

| | 1903. | 1904. |
|---|---|---|
| United States | 307,570 | 334,170 |
| Mexico | 45,315 | 50,945 |
| Canada | 19,320 | 19,185 |
| Newfoundland | 2,060 | 2,200 |
| Total North America | 374,265 | 406,500 |
| Argentine | 135 | 155 |
| Bolivia | 2,000 | 2,000 |
| Chile | 30,930 | 30,110 |
| Peru | 7,800 | 6,755 |
| Total South America | 40,865 | 39,020 |
| Austria | 1,055 | 1,275 |
| England | 500 | 500 |
| Germany | 21,205 | 21,045 |
| Hungary | 330 | 175 |
| Italy | 3,100 | 3,335 |
| Norway | 5,915 | 5,215 |
| Russia | 10,320 | 10,700 |
| Sweden | 455 | 390 |
| Spain and Portugal | 49,740 | 47,035 |
| Turkey | 1,400 | 950 |
| Total Europe | 94,020 | 90,820 |
| Australasia | 29,000 | 34,160 |
| South Africa | 5,230 | 7,775 |
| Japan | 31,360 | 34,850 |
| Total | 574,360 | 613,125 |

The figures for the United States above given are those estimated by THE ENGINEERING AND MINING JOURNAL, which have been used in this circular for two years past; the others have been collected and estimated by the authors of the circular. It contains particulars of some of the more noted mines, to which we are unable to give space here, and these show some interesting changes. Thus, in Mexico, where the Boleo was long the chief producer, we find that it now holds a subordinate position; the Greene, the Nacozari and other new operations furnishing three-quarters of the output. While the production of Mexico is only about one-sixth

that of the United States, it shows a larger proportional increase last year than that of any other important country. It may be noted also that Mexico is now the second producer in the world, its output last year exceeding that of Spain, which has for many years held the second rank. In other countries there is little of special importance to note. The output of Australasia showed a considerable gain; that of Japan was also larger than in 1903, a condition which was hardly to be expected. It is evident that the demand for copper for war material led to the intensive working of the mines, notwithstanding the difficulties imposed by the war itself upon labor and other factors. In European countries production was almost stationary, both gains and losses being comparatively small. The general tendency, however, is to a lower output. In South America also production was about stationary.

In another issue we hope to comment somewhat more fully upon this statement and on the effect of the facts presented upon the commercial position of the metal.

## Market Conditions.

April 26.

The metal markets have been generally quiet. In copper there has been some uncertainty, chiefly owing to political conditions abroad. At home the consumption is very large, and it is evident that manufacturers are using up their stocks rapidly, but they do not yet seem ready to come into the market, perhaps hoping for lower prices.

In other metals there is little change. Tin has shown the usual fluctuations. Lead consumption is steady, with no special incident. Spelter is perhaps a little stronger, but shows no important change.

Silver has been quiet and rather dull. The political conditions in the East are affecting this market somewhat.

The iron and steel markets are, in the main, quiet, though consumption continues extremely large, and manufacturers are all active. Requirements for material are filled for some time ahead, however, and new orders are rather slow.

In the West the coal markets are feeling the beginning of the lake movement; otherwise, they are quiet, and prices are not strong. In the East, both the bituminous and the anthracite markets are steady and without change.

## Bruno Kerl.*

By R. W. Raymond.

The death of Privy Councilor Bruno Kerl, on March 25, 1905, terminated a distinguished and useful career.

Bruno Kerl was born March 24, 1824, at St. Andreasberg in the Harz, and entered in 1840 the mining school of Clausthal, where he studied for three years, working at the same time in the mines and stamp-mills. After an additional year of practice in the silver-reduction and iron works of the Upper Harz, he passed his examination as a metallurgical graduate, and studied for a year at Göttingen under Wöhler in chemistry, Hausmann in mineralogy, and eminent teachers in other branches. In 1846 he was employed at the Oker works, but very soon left this post to become a tutor in chemistry, metallurgy, etc., at Clausthal, where he continued to labor until 1867. During this period the Clausthal school became a completely equipped mining academy and Kerl was made in 1862 a full professor.

Meanwhile, in addition to the work of instruction, he discharged simultaneously or successively the duties of many responsible official positions in the Royal Hanoverian administration of mines and smelting works, and also published many valuable works and treatises. Among these were professional guide-books to the Upper and Lower Harz, and their characteristic metallurgical processes; a manual of qualitative and quantitative blow-pipe analyses; another of metallurgical assaying; and, most important of all, a 'Handbook of Metallurgy' in four volumes, the second edition of which was issued in Leipzic, 1861-1865. This book was speedily recognized as the leading authority in its field. In this country the English translation by Crookes and Röhrig, published about 1869, had a large circulation.

In addition to these literary labors, Prof. Kerl became in 1859 (and continued to be until 1897) an associate editor of the *Berg- und Hüttennmännische Zeitung*, which owes no small part of its fame as a professional classic to his aid and direction.

These activities, together with his high reputation as an instructor and adviser, led to his appointment, in 1867, as professor of metallurgy, technical chemistry and assaying in the Royal Prussian Mining Academy at Berlin. This position he occupied (with some variation of its specific sphere) until the latter part of 1897, when he retired from active duties and occupations.

Shortly after this distinction was conferred upon him, his native kingdom of Hanover ceased to exist; but science knows no political boundaries, and his services were required in administrative lines by the Royal Prussian and the Imperial German governments. From 1868 to 1892 he was a member of the board of Manufacturing Industry in the Ministry of Commerce, and from 1877 to 1885 an official of the Imperial Patent Office. In 1889 the title of Privy Mining Councilor ("Geheimer Bergrath"), almost the last of a long series of orders and distinctions,[1] was conferred upon him.

His literary activity was continued in this new and larger sphere. Among the subjects treated by him in publications later than 1867 were: 'Advances in Metallurgical Assaying,' 'Outline of the Salt Manufacture,' 'Handbook of the Clay Industry,' and compact manuals of general metallurgy, the metallurgy of metals, the metallurgy of iron and steel, and assaying. He also co-operated in the preparation of a German version of Muspratt's great work on technical chemistry; and from 1871 to 1881 he issued annually a valuable 'Reportorium of Technical Literature.'

His retirement, in 1897, by reason of complete failure of health, was practically the end of his career; and his quiet and painless death, on March 25, 1905, at Gross-Lichterfelde, near Berlin, terminated a period of enforced inactivity and of suffering patiently borne.

Prof. Kerl was elected an honorary member of the Institute in 1890, and received this distinction with gratitude and pride. The onerous duties which he was already beginning to lay down, one by one, with advancing age, prevented him from contributing to the *Transactions;* but, long after he had ceased to be able to write with his own hand, and not long before death brought him release, he dictated a letter to the secretary of the Institute, expressing once more his sympathetic admiration of its work.

*Prepared for presentation at the Washington Meeting of the American Institute of Mining Engineers, May, 1905.

1 Besides the usual official promotions of the Hanoverian and Prussian civil services, he received knighthood in Hanoverian and Italian orders; and, upon his retirement in 1897, the "Red Eagle" of Prussia.

Water in the Egyptian Desert.—A recent expedition, sent into the desert area of southern Egypt, found a plentiful supply of water, at a depth of 145 ft., by the aid of Keystone drillers. It has been established that on the large area of land lying 20 miles north of Kharga water flows freely a few feet below the surface.

Belgian Iron Production.—The output of the Belgian blast-furnaces in February was 95,943 metric tons of pig iron. For the two months ending Feb. 28, the production was 208,763 tons, against 221,297 tons in the corresponding period of 1903; a decrease of 12,534 tons. On March 1 there were 33 furnaces in blast.

For experimental purposes, fine wire may be made by enclosing a metal, as gold, in another, as copper, drawing the whole down to the finest mechanical limit and then dissolving off the copper layer and leaving the fine gold nucleus.

# DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

## THE MINING LAW.

*The Editor:*

Sir—As a mining engineer and United States deputy mineral surveyor for Idaho, during the past 32 years, I have had occasion to watch the operation of our mining laws, and have long favored radical changes.

In a paper read before the Mining Congress which met at Boise, Idaho, several years ago, I set forth the changes that seemed to me advisable, and offered them in the form of a resolution in order to invite discussion, and so discover what the "standpatters" had to say in favor of their "thirty-year-old disgrace." My resolution was referred to a committee on cold storage, and I learned that the convention did not have time to discuss a paper involving so many and varied questions, especially as a learned professor was down for a long discourse on the probability of finding garnets at the North Pole. Senator Heyburn, at that convention, championed 'the law of the apex,' and demonstrated upon a blackboard his newly invented universal end-line. You can imagine, therefore, how I rejoice to find your valuable columns open to such bright and pertinent letters as those of friends Goodale and Purington.

Whom does the law of extra-lateral rights protect or benefit, unless it is the lawyers? Can anyone cite a case where a party is extracting ore outside of his own vertical lines and within the lines of another party, in which case there is not or has not been trouble? There may be such cases, but it is pretty certain that our lawyers have not heard of them, and for that reason perhaps such cases ought not to be made public. The prospector neither made the law, nor is he interested in defending it. It is the corporation lawyer who is most interested. The prospector seldom develops his claim beyond daylight, and the question of 'dip' rarely bothers him. It is his grantees, possibly, who, not finding just what they want within the limits of the plat purchased, desire the right to mine the surrounding country.

A repeal of the present law, by an enactment founded on practical common sense, would not affect vested rights, as it could not be retroactive. More than half of the present public lands would come under its operation. A small percentage of the mineral land is patented and not half of it is covered by mining locations. Subjoined is a list of the changes proposed:

1. Repeal the patent law in regard to mineral lands.

2. Extend public surveys over all unsurveyed lands at once.

3. Arrange to file on mining claims at the land offices.

4. Fix the size of a mining claim in some multiple of 10, say 40 acres, to be located in conformity with subdivision lines, as with other lands.

5. Make the boundaries vertical planes dropped from direct lines between established corners of the public surveys.

6. Make the filing of a mining location equivalent to a permit to mine *in perpetuo*, so long as the conditions imposed are fulfilled. The conditions should not be too onerous, and should be optional either to perform a certain amount of development work at stated times, or pay the equivalent in money into a fund to be expended in the district on public improvement.

7. Abolish all such nonsensical conditions as 'discovery,' 'finding pay ore,' 'rock in place,' 'lodes,' 'ledges,' etc., as pre-requisite to filing, but establish such regulations as will prevent the holding of agricultural ground, as such, by means of a mining location. There should be nothing to prevent the location of unoccupied lands of any description, for the purpose of mining, should anyone wish to invest money in underground exploration.

There is merit in the old idea that "All mines of previous metals should belong to the King,"[1] taking the word King to mean the People.

Let these mines be worked by the people for the people. The product goes into circulation among the people, and there never has been—never can be—an overproduction. When one set of people get tired of working a mining claim, let it revert to the Government, open for the next comer, who may succeed. If the Government grants a patent at all, it should be to those who have developed to great depth, and to these it should grant patents free of charge. At any rate, in case the present patent law is retained, it should be divested of a great deal of the red tape that now makes it so expensive to obtain a mineral patent. The Government now charges $5 per acre for lode lands, and surrounds the purchase with red tape so that it really costs an applicant a total of about $15 per acre, if there are no conflicts, to acquire title to the poorest land in the market. The Government gets $5, and the Surveyor-General's office, lawyers, and surveyors get the balance. The granger gets the best land, and has it surveyed for him and its boundaries fixed, at the minimum price of $1.25 per acre.

Under such regulations as are suggested there would not be as much need of a patent to mining ground as at present. The title would be clear and protected directly by the Government, while the nuisance of State interference would be abated. The only possible advantage in taking out a patent would be that property could be held without work or paying anything except nominal taxes. The need to discourage this is the best reason for refusing to issue patents for mining land. If the Government adheres to the policy of peddling out the public domain in limited tracts to individual citizens, there is a great deal to be said in favor of fixing a uniform price for lands of every description and permitting the purchaser to do as he pleases with his own, as he does now as soon as patent issues. It is impossible to classify lands as between mining and other lands. Those lands which are useless for any other purpose than sheep-herding are yet open for the prospector.

E. B. TRUE.

Pioneerville, Idaho, April 17, 1905.

## THE IODIMETRIC DETERMINATION OF COPPER.

*The Editor:*

Sir—With the purpose of bringing out a greater number of contributions regarding the comparative merits of the iodide and battery methods of estimating copper, the writer[1] reiterates all that he said in the issue of December 29. Mr. Van Agnew in the issue of April 6 claims more for the iodide method than has any other chemist of recent years. The writer has been in direct communication with many prominent chemists for the past three years, and not one has put forth the claims that Mr. Van Agnew does. In fact, for the assay of blister or refined copper, the writer does not believe that any American chemist would dare risk his reputation, to say nothing of his position, by its use. Did the writer have work of this nature, he certainly would not.

Working on one gram of copper the battery method does *not* give results close enough to satisfy trade demands, hence the custom of using at least five grams, and electrolizing for 36 hours and longer, is now considered the best practice. Mr. George L. Heath, of the Calumet & Hecla smelter, says: "The principle of electrolysis is the only one to be depended upon. In the titration methods usually employed for low-grade materials, the margin of difference in the case of refined copper between standard and sample is too small, and the liability to appreciable error is too great, to permit as exact works as the battery assay; 4 to 5 grams of metal is the least quantity which will theoretically produce results within a limit of error of 0.01 per cent.[2]

Mr. Van Agnew states that two drops of his standard equals 0.01% of copper. He uses 0.25 grams of material and must multiply his titration figures by four. Allowing for a probable slight error in weighing, too slight were it one gram or more, and making a slight error in his titrating, his final error is very liable to be more than

[1] At the particular request of Mr. Thorn Smith we have retained the use of the third person in place of the customary first person singular.—THE EDITOR.

[2] Methods for the Complete Analysis of Refined Copper.' *Journal* of the American Chemical Society, March, 1905.

desired. Not many of us can work on such a small quantity and secure accurate results. That chemists should endeavor to do so is evidence of faulty teaching. That Mr. Van Agnew's results should invariably agree with the Moscow figures is a surprising statement to make. Comment is not necessary, but conditions in Russia may be different.

Mr. Van Agnew previously states that the sole reason left for considering the iodide method to be less accurate is the fact that aluminum alone may not always completely precipitate the copper. This he grants, as do most chemists. The writer certainly did not intend to convey the idea in his previous letter; the complete precipitation of the copper is easily made, after the aluminum has apparently done its work, by the addition of a little $H_2S$ water.

Mr. W. N. Musgrove, in your issue of March 16, does not agree with the writer that aluminum does not cause complete precipitation. A Western chemist has also written that he, also, has no difficulty in this direction. However, in the writer's correspondence all but this one have called attention to this point. That the nature of the solution makes a difference is without doubt. A copper solution of an ore or matte containing but a small amount of iron is precipitated much more quickly than in a solution containing a marked quantity. It is also to be noted that the precipitation is much more liable to be complete at the time of discoloration. We are all liable to generalize and assume that all ores act like our own.

Another point which the writers on this subject are overlooking is the oxidization of the precipitated copper on filtering. Mr. Low, the originator of the aluminum method of precipitation, stated to the writer several years ago that this might make a difference of as high as 0.15%. Approximate accuracy would thus demand the use of $H_2S$. The writer can simply reiterate his previous statement that in his practice precipitation is not always complete, even when the solution is boiled for several minutes after decolorization.

The iodide method cannot be compared with the battery method for accurate work. Its superiority over all other volumetric methods is unquestioned. In work where strict accuracy is not required it answers perfectly; in fact, it may well displace the electrolytic method where a large number of determinations must be turned out in a given time. In buying or selling ore, where a few tenths of a per cent are of importance, this method is entirely out of place.

In regard to the electrolytic method the writer quotes his former letter as follows: "The electrolytic method admits of the widest variation in manipulation and detail; it requires the least expenditure of time, and the least attention. The manipulation is reduced to a minimum; in fact, many chemists 'plate' in the same beaker in which the sample is weighed. A maximum weight of material can be taken, and interfering metals are removed with comparative ease. Work carefully done admits of no doubt as to its accuracy, and the amount of work that can be done is limited only by the number of cathodes in the laboratory."

After all is said and done "the proof of the pudding is in the eating," and if a chemist can secure accurate results by the iodide method or any other volumetric method, and can keep out of hot water, he is indeed a fortunate man.

THORN SMITH.

Isabella, Tenn., April 15, 1905.

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MARKING SAMPLES.

*The Editor:*

Sir—Every mining engineer sometimes returns from a trip only to find some mark on his samples illegible. Marks on the outside of sample bags are easily obliterated, and a paper tag, no matter how closely folded, and protected, often loses its identity from contact with mud, water, saddle-bags and express cars. Even careful men who go provided with metal tags or

*From a Splinter.*

*From Brushwood.*

other similar devices are sometimes caught unprepared, usually falling back on the paper tag or outside mark.

All this trouble can be avoided by the following simple method: In each sack place one or more tags made from any small piece of wood lying around the mine—there is always plenty within reach. On these wooden tags cut with a knife the sample number. By using the Roman numerals all the lines are straight and easily and quickly cut, even by the light of a flickering candle. The two numbers IX and XI are the only interferences, but one or the other can be omitted or a distinguishing mark added. Instead of C for 100, cut N, and instead of D for 500, cut W. Each line is cut clear acoss the tag, and the method and result will be clear from the accompanying sketch, which shows the tags approximately. The idea is simple, and no paraphernalia is required other than the knife that every American carries in his pocket. Such tags defy dirt and water, and cannot be made illegible short of destruction.

W. G. SWART.

Denver, Colo., April 17, 1905.

MINING ENGINEERING AT OXFORD AND CAMBRIDGE.

*The Editor:*

Sir—Wonders never cease. Perhaps the most wonderful thing to an old-time Oxford or Cambridge man is the radical changes which have of late years taken place in those time-honored and most conservative institutions of classics and mathematics. The effort seems to have been to keep pace with the practical and commercial spirit of the age. In my day at Oxford, classics, and nothing but classics, was the thing. A small inconspicuous department, patronized by a few students only, was devoted to chemistry and natural science. The students who went in for this course were under a certain stigma, and the study of natural science was not considered worthy of the gentlemen who mused over the time-honored classics, thoughtfully memorized Latin and Greek roots, or quoted elegantly from Horace and Juvenal. A few heterodox individuals of a sceptical disposition sometimes ventured to silently question the *cui bono* of so much ancient unpractical study, and to inquire whether the end was not to produce rather elegant and incompetent Romans and Greeks than modern practical Englishmen. But this was long ago, and doubtless it may be said, *"Nous avons changé tout cela."* Ruskin, I have heard, succeeded in establishing a chair of fine art at Oxford, and I understand other chairs of theoretical and applied science have been made. To the credit of Cambridge it must be said that from an early date she sent forth from her cloisters some of the best geologists England has ever produced, perhaps because from an early time geology has been recognized in England as a gentlemanly accomplishment, culture, recreation and study for amateurs of scientific and literary education. An immense amount of good local work has been done by these non-professional amateurs in the geological field of Great Britain. Now, Great Britain is perhaps appreciating the fact that scientific and theoretical geology, while admirable as a means of culture and element for thought, needs to be added to or replaced by a practical geology that can be applied commercially to the mining interests of the country and its foreign possessions. So I read in the *Mining Journal* of March 25, of a Mining and Engineering school being established at Oxford and a similar one at Cambridge. To quote, it says:

"As there is no qualification test imposed by law for those following the various branches of the engineering profession as in the case of medicine, it is at present impossible to determine the precise position which the newly founded school will take as a training ground for mining and metallurgical engineers. In view of the large body of practical opinion which urges that those who are to have the charge of mines should as early

s possible be brought into contact with ractical work under commercial condi- ons, it is at least possible that the Uni- ersity's scheme, providing, as it does, or a certain course in mines, may appeal o many as a sufficient groundwork on which to base their pofessional work. It has undoubtedly been a misfortune that our industrial leaders could not readily combine a practical study of and the at- tainment of recognized qualifications in the industries in which their fortunes are engaged in association with the many- sided life and culture of the universities. The general body of our industries every day becomes more highly organized and scientific in character, and the necessity for a good general education, at any rate for its directors, is increasingly manifest."

Personally, some may feel a little sorry to see mining and engineering schools established at Oxford and Cambridge; they could almost wish those time-honored and poetic institutions to retain their hallowed medieval character, and to continue to turn out statesmen, poets, historians, clergymen, literati and men of elegance and refinement, and locate mining and engineering schools in an atmosphere more congenial to those subjects, as in the mining districts of Great Britain. The atmosphere of Oxford, as I remember it, was not congenial to such pursuits; while many Oxford and Cambridge men have turned out notable engineers and practical men, it has not been, I think, so much from what they studied at Oxford and Cambridge—the mental pabulum, so to speak, that was placed before them—as the discipline and thoroughness of those institutions, and the contact with the best men and minds of the age at those universities, added to the thoroughness with which the classics were 'licked' into them, before they went to the universities, at the classical public schools that prepared them as boys for the great battle of life as men. So that, whatever they afterwards took up, they did with thoroughness and conscientiousness and with indomitable British pluck. The training was good, if severe, and in many respects it adapted them for the old-world professions into which they were going. If the objects of the universities were to train men for modern practical and technical life, such as we understand it in Western America or in the engineering and mining field, the pabulum diet might well have been changed or made different from that of the classics, and students might with greater profit, but with equal thoroughness, have pored over the profound and minute elements of chemistry, geology or kindred sciences, as they did over Greek and Latin and passages from the classics. As it is, should the Oxonian of by-gone times have been thrown by circumstances in a very different field or profession from that for which his university education intended him, he might have found himself, for a time at least, at sea. He is all there—a well educated man, a fine fellow, perhaps, but he has a lot to learn. He may be for a time at the very bottom of the ladder of practical life, and have to hobnob with those infinitely his inferior in classic culture or literary lore, but who at least know how to make a living. A technical education, as thorough as Oxford and Cambridge classics and mathematics, would not, I think, have left him in such a plight, but caused him to feel he had a sword in his hand and could hold his own with the best. Some men, thrown in such circumstances, have found the training of the boat-clubs their most valuable asset.

OXONIAN.

Denver, Colo., April 20, 1905.

## New Operations in the Connellsville Region.*

The purchase of 240 acres of Connellsville coal land by the Struthers Furnace Company, Struthers, O., located near New Salem, Fayette county, Pa., at $1,200 an acre, establishes a new high record for coal acreage in the Connellsville region. While small tracts have sold as high as $1,350, large acreages have been disposed of at considerably lower prices. In addition, a shaft nearly 400 ft. deep will have to be sunk to develop the property in question, thus greatly increasing the cost of operation. A plant of 160 bee-hive ovens will be built, the output of which will be sufficient to provide the one furnace operated by this company.

The purchase of coal land and erection of coking plants in both the upper and lower Connellsville region at the present time has almost reached the proportions of the great Klondike boom five years ago, which marked the development of the lower Connellsville region. The erection of 1,000 ovens by the H. C. Frick Coke Company in the upper region is the largest operation undertaken this year, and a number of these ovens have already been fired, while the remainder will be placed in operation in a few weeks. The completion of these ovens makes a total of 30,023 ovens in the Connellsville region, and before the end of the year this will be increased by more than 1,000, now under construction and projected.

The Republic Iron & Steel Company recently awarded contracts for the erection of 400 ovens in the lower Connellsville region, while the Taylor Coal & Coke Company of Cleveland will erect 500, the contract for 150 having already been let. The Connellsville Central Coke Company, Pittsburg, has 50 ovens additional under construction, and contemplates the erection of 200 more, making a plant of 400 ovens. Smaller operations include the erection of 40 ovens by the Century Coke Company and 80 by the A. L. Keister Coke Company. At the present time four independent iron and steel concerns, operating blast-furnaces, are seeking coking-coal properties in the Connellsville region, and there is every indication that prices will soon advance to $1,500 an acre. The Hibbs property, for which $1,200 an acre was paid, was purchased 10 years ago at $75 an acre, and this is a fair example of the increase in the value of coking-coal property in this region in recent years. The coal property recently purchased by the Jones & Laughlin Steel Company, Pittsburg, near Brownsville, Pa., and which is outside of the Connellsville region, averaged about $330 an acre, for a total of 9,000 acres.

The H. C. Frick Coke Company is aiming to strengthen further its holdings in the Connellsville region by acquiring developed properties, and the deal for the purchase of the Hecla Coke Company, Pittsburg, which was dropped some time ago, is again under consideration, with fair prospects of a successful termination. If this property is secured efforts will be made to acquire the properties of the Oliver & Snyder Steel Company, the two plants containing close to 2,000 ovens, while about 7,000 acres of coal land would be acquired. The Lackawanna Steel Company, Buffalo, is also quietly negotiating for coal lands in the Connellsville region, as it is now practically securing all its coke from this district, being the largest independent consumer of Connellsville coke in the country. It is altogether probable that this company will acquire coal property in the lower region, and will coke it at its own ovens in Buffalo.

The lower Connellsville region, which was practically unknown five or six years ago, is now producing over 80,000 tons of coke weekly and has a total of 6,742 ovens. Almost all of the new development among the independent producers is in this region, and outside of the additions of the H. C. Frick Coke Company, all of the new operations are being carried out in this field.

*From the *Iron Trade Review*, Cleveland, April 20.

NEW VANADIUM PROCESS.—H. Herrenschmidt (*Comptes Rendus*, Vol. 139, 1904) describes a new process for extracting vanadium from a lead vanadate ore containing 12 to 14% of vanadic oxide to about 50% of lead. The ore is melted in a reverberatory furnace with sodium carbonate and coal; metallic lead is obtained and the slag contains vanadate and aluminate of sodium. The slag is re-melted and oxidized by air and finally granulated by being run into boiling water, when 95% of the sodium vanadate passes into solution. To make ferro-vanadium, the solution is precipitated by the addition of iron sulphate and sodium carbonate. The precipitate is dried and reduced by the Goldschmidt aluminum process to an alloy containing 33% of vanadium and 66% of iron. Sulphates of nickel, copper, or cobalt may be used to make analogous alloys.

## Mining Stocks.

(See quotations on pages 823 and 824.)

**New York.** April 26.

The unexpected rise in money rates, explained by heavy speculation recently, had a reactionary effect on stock quotations. Simultaneously there was marked liquidation in shares which only a few days before had attained their high point for the year. Thus Amalgamated Copper, now on a 4% dividend basis, sold on April 20 over 242,000 shares at as high as $86.75; but on April 24 sales of 178,350 shares lowered the quotation to $80.375. This reduction of $6.375 per share in four days is equivalent to over a year and a half dividends. Anaconda softened from $30.25 to $29.25, but as few sales have been made the public was little concerned. Greene Consolidated Copper dropped from $28.50 to $27, and Tennessee from $29 to $27, without attracting any special attention. British Columbia Copper moved between $6.75 and $7.125 on 'suggested' selling. United Copper common sold at $25.50@$27.125, and the preferred at $70.50@$72. Some business was done in Greene Gold at $7.875@$7.375, an average of $7.625, which at the dividend rate of 20c. per share bi-monthly, will yield nearly 16% per annum.

Further sales of Homestake Gold, of South Dakota, are reported at $80, upon which the annual dividend rate will be 7.5%. Standard Consolidated, of California, reappeared at $1.80@$1.70.

The usual match-order trading has been shown in the Comstock stocks. Portland, of Cripple Creek, has been exchanged at $2.20.

There has been some relaxation in the interest recently manifest in the industrial group. American Smelting & Refining common stock weakened from $119.50 to $113.50, and the preferred from $123.125 to $121.50. A sale of Federal Mining & Smelting common is noted at $105, while the preferred changed hands at $99.375@$97.50 per share.

For the purpose of evading the tax on the transfer of stock, proposed by the New York Legislature, an exchange has been formed in New Jersey by prominent financiers. The New Jersey Stock Exchange is capitalized at $250,000, to be represented by 500 memberships at $500 each. Its board of governors is divided into two classes, the first to be elected for one year, the second for two, and all for two years thereafter.

**Boston.** April 25.

There have been but three market days at this center in the last week, for besides closing over Good Friday and Saturday, April 19 is a State holiday, being Patriots' Day in commemoration of the Battle of Lexington. Until to-day's rally the stock market was under considerable pressure, and prices declined materially as a rule, although some stocks record net gains for the week. The weaker tendency of the metal has caused some liquidation, no doubt, but the best reason is that there is little interest outside of a few stocks. The settlement of the strikes in the various lake mines was not reflected in market prices, any more than was the inauguration of the same some time ago. There is a better feeling regarding Amalgamated, notwithstanding Lawson's talk against it, and the sentiment is that an increased dividend rate can be looked forward to in the not far distant future. The stock broke to $80.62½ Monday, but rallied to $84 today, which is $3 lower than a week ago.

United States Mining, Bingham Consolidated, Utah Consolidated and Boston Consolidated, all Utah stocks, have been well looked out for by houses having New York connections. United States broke $2 to $29.50, but rallied to $32, while Bingham broke from $34.25 to $31.50, with a $2 recovery. Utah is being constantly corraled by a house, in which one of the partners is related to Mr. H. H. Rogers. This stock has varied from $42.25 to $43.25 and made the $1 advance, while the balance of the list was soft. Boston has varied from $7.75 to $8.12½, quite large blocks being dealt in.

Allouez rose $1 to $20 on favorable reports from the mine, and Centennial spurted from $17 to $18.75 on favorable news also. Isle Royale fell $.150 to $20, but rallied sharply to $24. There has been accumulation in this stock, and the decline was to help this cause. Osceola has been freely offered by Lawson brokers, with the result that it yielded $5.50 to $92.50, but it recovered to $96.12½. Old Dominion slid off $1.75 to $24, but has recovered the loss. Mohawk fell $2.50 to $49, but is back to $50. Parrot is off $1.75 to $25. Tamarack $5 to $120, and Trinity 75c. to $8.75. Mass and Michigan both went off, the former closing 25c. lower than a week ago at $9.25, and the latter 25c. lower at $12.75, although it went as low as $11.25. Atlantic is off almost $1 to $14.75, and Copper Range broke $3.50 to $71, with subsequent recovery to $73.75. Greene broke $2.75 to $27.25, but rallied to $28 again. Shannon is up fractionally to $7.62½. The increase in the Anaconda dividend is another favorable factor in the copper share market, as it increases the Amalgamated Company's earnings. Daly-West holds well about $14, now that there is no danger from flood from the Ontario mine.

Talk is heard that the Amalgamated controls Heinze's United Copper, but it cannot be substantiated here. The stock has been less active and inclined to be heavy since the Minnie Healey decision.

**Colorado Springs.** April 21.

The local stock market has not been quite as active during the past week, and the trading in Cripple Creek stocks was pretty well distributed between mines and prospects. There has been no sensational feature, but the most active stock on the mines list was Findley, which was traded in quite heavily.

The $1,000,000 suit between the Morning Glory Co. and the Mary McKinney Co. has been settled by the latter paying in the neighborhood of $100,000 for ore alleged to have been taken from the former's territory. The annual report of the Work Co. for the year ending April 30, 1905, shows that company to have received $12,146 in royalties.

El Paso gained a few cents during the week, while Portland declined about the same amount, the former closing at $2.17 @$2.19, with no sales, and the latter selling for $2.12. Elkton has also dropped, selling for 50½c. Findley has advanced about 6c. on quite heavy trading to 76½c. Gold Sovereign is selling for 14¾; Golden Cycle, 60; Independence, 22; United Gold Mines, 23; Anaconda, 15; Isabella, 28@30; Work, 13¼@14c. per share.

**San Francisco.** April 20.

Dealing in the Comstocks has been rather quieter, and has been confined mainly to regular operators. Ophir closed at $10.50; Mexican, $2.40@$2.45; Consolidated California & Virginia, $1.80; Hale & Norcross, 90c.; Sierra Nevada, 41c.; Gould & Curry, 27c. per share.

On the San Francisco & Tonopah Exchange business was pretty active, and there was a good deal of buying. Montana Tonopah was quoted at $3.40; Tonopah Midway, $1.70; Gold Anchor, $1.10; Tonopah North Star, 50c.; McNamara, 45c.; Tonopah Home, 36c.; Red Top, 39c.; Rothwell, 25c. per share.

On the California Exchange business in oil stocks was very quiet. Buyers seem to be out of the market altogether. Monte Cristo brought 75c., and Claremont, 70c. per share.

## Coal Trade Review.

NEW YORK, April 26.

ANTHRACITE.

The hard coal market shows the expected stimulus at the approach of the May advance in the circular price. As an evidence of this, the Pennsylvania Railroad shipments during the week ending April 15 were 109,751 tons, as compared with 80,602 tons of the week previous. The mines are working as nearly full time as circumstances will permit. Good Friday and the Easter holidays were quite universally observed in the anthracite fields; on Monday of this week, several mines having been shut down completely and others working with only part force.

No difficulty is experienced in disposing of all the coal arriving at tidewater. Broken coal, however, appears to be in light demand, and in fact it is stated on the best authority that this coal is being relegated along with the old-fashioned steamboat size to the rear rank. As would be expected from the heavy output of domestic sizes, the steam sizes are in large supply, although the accumulation has as yet had no effect upon the selling price. The domestic sizes, particularly stove coal, are in strong demand, many householders evincing a determination to stock up to the limit of their storage capacity against the winter and a possible disturbance in the spring. Prices remain as follows, f. o. b. New York harbor shipping points: Domestic sizes, $4.25 for broken, and $4.50 for egg, stove and chestnut. Steam sizes, $3 for pea, $2.25@$2.50 for buckwheat, $1.34@$1.50 for rice, and $1.30@$1.35 for barley.

BITUMINOUS.

The Atlantic seaboard soft coal market continues weak, and prices on the cheaper grades are low. This is still the result of the large amounts of speculative coal that were shipped here several weeks ago, which are not yet entirely disposed of. Some of this has been offered at $2.20, f. o. b. New York harbor shipping ports; while slightly lower figures are offered on part of the remainder, and on the coal expected in the immediate future. These conditions have caused a feverishness in the general market, which is expected to be relieved as soon as this coal is marketed. The contract season is progressing quietly, although the low prices in the speculative market have caused delay on the part of consumers, and in some cases have postponed the placing of contracts. The explanation of the abnormal conditions does not always succeed in convincing a consumer as to the advisability of placing his contract at once. The better grades of steam coal show that their contract tonnage is well taken, yet it is difficult to estimate exactly what proportion of the season's business has been closed up.

Trade in the far East is quiet. A large quantity of coal has arrived at the discharging points, and for this reason con-

umers are inclined to delay their orders o as to escape demurrage charges. Trade long the Sound is taking coal only to a mall extent. The soft coal trade in this erritory seems to be merely incidental to he anthracite business, the principal attention being given to hard coal. New York harbor trade is afflicted with a great amount of coal at tide, which has oversupplied the market and lowere current rices. The all-rail trade is moving quickly a fair tonnage of coal, and prices are inclined to be weaker than they have been. Transportation from mines to tide is excellent, train schedules often being improved upon, and car supply is up to all demands.

The coastwise vessel market shows a slight scarcity of medium-size and light-draft vesssl. This is due to the rush of the anthracite trade, which some vessel-brokers report that the lumber trade is attracting a large tonnage, owing to better rates. Philadelphia quotes on large vessels as follows: To Boston, Salem and Portland, 75c.; to Lynn, Newburyport, Gardner and Bangor, 90c.; to the Sound, 65c.; to Portsmouth, 80c.; to Bath, 75@80c.; to Saco, $1 and towages. Norfolk and Newport News quote about the same. The current New York rate is 65@70c. to around the capes.

### Birmingham. April 24.

The coal production in Alabama is steadily increasing. New mines are picking up in their output, while the old mines are keeping up steady production. The Alabama Steel & Wire Co. is bringing miners to this district from Tennessee to take up work in the Virginia mines, where the awful explosion took place in February. Alabama miners appear to be superstitious about working in the mines there, and therefore it was necessary to bring other men here.

The Tennessee Coal, Iron & Railroad Co. will shortly have in operation the old Shannon mines, in the Blue Creek region, which have not been worked in several years. The water is now being pumped out. The fire in the Sumter mines, also in the Blue Creek region, is now out.

The report of the Alabama Car Service Association for the month of March, recently published, shows that the railroads belonging to the association handled 68,829 cars, against 66,497 for the same month in 1903. The improvement is accounted for by the increased production of coal and coke and a better output of iron.

The railroads handling coke from West Virginia have decided on an advance in the freight rates on the product, ranging from 25c. to 50c. per ton. There is still considerable coke being imported.

### Chicago. April 24.

The wholesale market for coal is, in general, much better than it was last week. Prices are firmer, supplies on track are less on account of the restriction of shipments, and consumption has been greater than was anticipated, especially of Eastern bituminous. Western coal, it must be said, is still weak, and the prospects for it are not bright, but even this, apparently, is being diverted from the local market in the last week. Anthracite is beginning to arrive by the lakes, and the rail trade is satisfactory to the trade generally.

Steam coals from Illinois and Indiana mines bring 10@15c. more than last week for run-of-mine, which is most in demand. Fine coals are a little stronger, and lump is in light demand. Hocking is firm again, a result of restriction of shipments, with sales close to the $3 mark. Smokeless has been scarce, and the circular price of $3.05 probably has been maintained on most sales. Youghiogheny on current sales is in light demand at about $3, with a good supply.

Contract business still languishes, and when transacted is at low prices, the tendency of buyers being strongly to trust to a continuance of the present conditions, so favorable to themselves.

### Pittsburg. April 25.

*Coal.*—There seems to be some grounds for the report recently in circulation that the Pittsburg Coal Cofl is negotiating for the sale of its control of the Monongahela River Consolidated Coal & Coke Co. to an eastern syndicate. No official information is given out, but it is known that a conference was held in New York last week, which continued for several days. According to reports, there is a movement to obtain control of all the mines and property along the Monongahela river. The projectors of the enterprise, it is said, intend to capture the entire river coal trade between Pittsburg and New Orleans, and to engage extensively in exporting coal to South America. Shipments to lake ports for the northwestern markets are increasing, and a number of idle mines will be put in operation before the end of the week. The railroads are furnishing all the cars required, and the tonnage from the Pittsburg district this season will be greater than in any former year. Prices here remain about the same, and are on a basis of $1@$1.10 for run-of-mine.

*Connellsville Coke.—Production and* shipments were greater last week, and prices remain about the same. Furnace coke is quoted at $2@$2.25 per ton, and foundry at $2.75@$3. The production for the week amounted to 263,000 tons, and shipments aggregated 12,060 cars, distributed as follows: To Pittsburg and river points, 4,666 cars; to points west of Pittsburg, 6,183 cars; to points east of Everson, 1,211 cars.

### San Francisco. April 20.

The coal market here continues firm, with very little change, and business is about as usual at this season. Fuel oil continues in good demand.

For Coast coals, in large lots to dealers, prices are as follows: Wellington, New Wellington and Richmond, $8; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; White Ash, $5.25. For Rocky Mountain coals, in car lots, quotations are: Colorado anthracite, $14; Castle Gate, Clear Creek, Rock Springs and Sunny Side, $8.50. Eastern coals are nominal at $14 for Pennsylvania anthracite, and $13 for Cumberland. For foreign coal quotations are, ex-ship: Welsh anthracite, $13; cannel, $8.50; Wallsend and Brymbo, $7.50 per ton.

### Foreign Coal Trade April 26.

Exports of fuel from Great Britain for the three months ending March 31 were as follows, in long tons:

| | 1904. | 1905. | Changes. |
|---|---|---|---|
| Coal | 10,506,869 | 11,041,534 | I. 534,665 |
| Coke | 177,396 | 148,664 | D. 28,732 |
| Briquettes | 323,357 | 270,188 | D. 53,169 |
| Total | 11,007,622 | 11,460,386 | I. 452,764 |

In addition to these exports, the coal sent abroad for the use of steamers engaged in foreign trade was 3,951,082 tons in 1904, and 4,145,653 tons in 1905, an increase of 194,571 tons this year.

The shipments to the United States, included in the exports above, were as follows:

| | 1904. | 1905. | Changes. |
|---|---|---|---|
| Atlantic ports | 18,651 | 12,986 | D. 5,665 |
| Pacific ports | 25,223 | 12,593 | D. 12,630 |
| Total | 43,874 | 25,579 | D. 18,295 |

The trade with the United States has been very light so far this year.

Imports of coal into the Straits Settlements for the full year are reported as follows:

| | 1903. | 1904. | Changes. |
|---|---|---|---|
| Japan | 388,720 | 400,628 | I. 11,908 |
| Australia | 44,468 | 38,667 | D. 5,801 |
| India | 76,356 | 125,612 | I. 49,256 |
| Borneo and Indo-China | 13,232 | 11,820 | D. 1,412 |
| Great Britain | 53,020 | 42,969 | D. 10,051 |
| Total | 575,796 | 619,696 | I. 43,900 |

It will be seen that Japan furnished nearly two-thirds of the coal used last year. There was a considerable gain in the receipts of Indian coal.

## Iron Trade Review.

NEW YORK, April 26.

The iron markets show but little change from our last report. The apparent lull in new orders has been broken a little by some negotiations for future business, but the market may still be considered quiet, so far as new contracts are concerned. This, however, does not affect the activity in almost all lines, as mills and furnaces continue very busy on orders, and most large consumers are contracted for the third quarter, and some of them well up toward the end of the year.

The only change in prices to be noted is the advance in pipes and tubes, which was not generally expected. The advance amounts to $1 per ton on steel pipe, and $4 per ton on boiler tubes.

Structural business continues to improve, with the prospect of a quiet year in the building trades. The orders for standard sections of steel rails are still coming rather slowly, but a considerable quantity of business for electric roads is developing.

There have been reports of a serious difference between the United States Steel Corporation and the Wabash railroad. At the time the Wabash extension into Pittsburg was planned, it was understood that an agreement had been made with the Carnegie Steel Co., covering a portion of its freight. The first report was that the Steel Corporation had declined to carry this out, and ordered that no freight be given to the Wabash lines. The latest statement, however, is that the difficulty has been arranged, and that those lines will receive a proportion of the Pittsburg business of the corporation.

*United States Steel Corporation.*—The preliminary statement for the quarter ending March 31 shows an increase in net earnings of $9,580,664, as compared with the first quarter of 1904. The net earnings are the amount remaining after deducting, each month, the expenditures for ordinary repairs, renewals and maintenance of plants, also interest on bonds and fixed charges of the subsidiary companies. The condensed statement is as follows:

| | |
|---|---|
| Net earnings for the quarter | $23,025,896 |
| Depreciation and reserve funds, etc. | $3,910,607 |
| Interest and sinking funds | 6,936,963 |
| Total charges | $10 847,570 |
| Surplus | $12,178,326 |

From this surplus there was appropriated $6,304,919 for the dividend of 1¾% on preferred stock, and $3,300,000 for new construction and property, a total of $9,604,919, leaving an undivided surplus amounting to $2,573,407 for the quarter.

The net earnings were the largest reported since the third quarter of 1903. The total of unfilled orders on hand April 1 was 5,597,560 tons. This is the largest quantity ever reported at the beginning of the quarter, and compares with 4,136,961 tons on the corresponding date last year. This statement gives promise of active business for some time to come.

*Iron Trade of Great Britain.*—The exports of iron and steel, and manufactures thereof, from Great Britain for the three months ending March 28 are valued by the Board of Trade returns as follows:

| | 1904. | 1905. | Changes. |
|---|---|---|---|
| Iron and st'l | £6,707,140 | £7,181,297 I. | £474,157 |
| Machinery | 4,606,269 | 5,230,150 I. | 623,881 |
| New ships | 730,549 | 731,900 I. | 1,351 |
| Totals... | £12,043,958 | £13,143,347 I. | £1,099,389 |

During the three months ending March 31, 6,033 tons of mining machinery were exported from the United Kingdom, the value amounting to £190,061, as compared with £208,602 in 1904, and £168,486 in 1903. Machinery to the value of £62,193 was shipped to British South Africa, as against £101,801 last year, and there were increased shipments to countries in Europe and other countries; the shipments to Australia and the East Indies decreased.

The chief items of the iron and steel exports were as follows, in long tons:

| | 1904. | 1905. | Changes. |
|---|---|---|---|
| Pig iron | 191,421 | 180,487 | D. 10,934 |
| Wrought iron | 44,463 | 41,147 | D. 3,316 |
| Sheets | 97,031 | 101,801 | I. 4,770 |
| Plates | 31,843 | 39,373 | I. 7,530 |
| Rails | 111,150 | 133,586 | I. 22,436 |
| Steel ingots, etc | 26,478 | 30,860 | I. 4,382 |
| Tin-plates | 82,050 | 95,689 | I. 13,639 |
| All other kinds | 171,329 | 184,832 | I. 13,503 |

The more notable increases were in rails, plates and tin-plates. The total increase in quantities was 52,010 tons, or 6.9%, over last year.

Imports of iron and steel into Great Britain for the three months ending March 28 were valued at £1,961,180 in 1904, and £1,972,138 in 1905, an increase of £10,958. Imports of machinery were valued at £1,124,594 in 1904, and £1,156,430 in 1905, an increase of £31,836. The chief items of the iron and steel imports were, in long tons:

| | 1904. | 1905. | Changes. |
|---|---|---|---|
| Pig iron | 29,112 | 31,707 | I. 2,595 |
| Wrought iron | 32,220 | 20,719 | D. 11,501 |
| Steel ingots, etc | 131,579 | 148,214 | I. 16,635 |
| Structural steel | 28,849 | 27,730 | D. 1,119 |
| All other forms | 98,981 | 89,169 | D. 9,812 |

The most important increase was in steel billets, bars, blooms and other semi-finished forms; these came chiefly from Germany. The structural steel was chiefly from Belgium.

Imports of iron ore for the three months were: Manganiferous, 83,428; other ores, 1,513,231; total, 1,596,659 tons, an increase of 211,702 tons over last year. Of the imports this year, 1,380,439 tons were from Spain.

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**Birmingham.** April 24.

Alabama pig iron manufacturers are selling their product about as quickly as they are making it. The production also is healthier than it has been in 12 months, with indications of further improvement. Two furnaces went into blast during the past week and one more will start up this week. Another furnace will be ready week after next, while the small Williamson furnace in the city should be making iron before May 15. A prominent official of one of the larger iron companies in this district states that, as far as his own company is concerned, the sales are equal to the production. There are no indications that the demand is going to slacken.

The Tennessee Coal, Iron & Railroad Co. blew in one of the Bessemer furnaces the first of the past week, while the Alabama Steel & Wire Co. is making iron again at Gadsden furnace. The new furnace of the Tennessee company, at Ensley, is completed and fire has been started. One of the furnaces at Ensley will be repaired after this week, the new furnace just put in blast to take its place. The Woodward Iron Co. will blow in its new furnace during the next fortnight, and then blow out an old furnace for repairs.

The following quotations are given: No. 1 foundry, $14@$14.25; No. 2 foundry, $13.50@$13.75; No. 3 foundry, $13@$13.50; No. 4 foundry, $12.50@$13; gray forge, $12@$12.50; No. 1 soft, $14@$14.25; No. 2 soft, $13.50@$13.75. Several small orders of special analysis iron have been sold in this district lately at good prices.

The certificate of incorporation of the Sheffield Cast Iron Pipe & Foundry Co., capital stock $500,000, has been filed for record at Tuscumbia. Among the directors are W. N. Parsons and J. G. Aderton, of New York. Work has been started on the actual erection of the plant. J. W. Worthington, of the Sheffield Co., is president of the new company.

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**Chicago.** April 24.

Sales of iron, both pig and finished products, continue good. The effect of the large purchase by the International Harvester Co. has continued, and there are no signs that the market will weaken. Most of the business being done is in small lots, but these are numerous, keeping the aggregate tonnage about the same from week to week. Prices are unchanged, Northern No. 2 being $17.50, and Southern $13.50, Birmingham, or $17.15, Chicago. The Southern freight rate of $3.65 from Birmingham to Chicago and local territory has been continued indefinitely. It is probable that considerable business is being done slightly under the standard prices quoted, but the cutting is not extensive, nor does it affect the trade to any great extent. Charcoal iron is in good demand at $18@$18.50.

Business is especially good for Northern furnaces, which are making terms somewhat more liberal to buyers than Southern furnaces. The bulk of the business is for the third and fourth quarters of 1905, with orders running occasionally into 1906. Inquiries are heavy, indicating a large business in the coming weeks.

Coke is in better demand, with no large amount on track, and the prospects good for increasing demand. Prices are unchanged, 72-hour Connellsville bringing $5.65, and standard cokes 25c.@50c. less.

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**New York.** April 26.

While new business in most lines is coming in only in moderate quantities, prices are steady, and in some lines firmer.

*Pig Iron.*—Sales have been somewhat better, though business continues to be in moderate-sized lots. Quotations are again a little firmer. For Northern brands we quote, in large lots, as follows: No. 1X foundry, $17.75@$18; No. 2X, $17.50@$17.75; No. 2 plain, $16.75@$17; gray forge, $16@$16.25. Virginia foundry is a little higher, being quoted at $17.90@$18.15, tidewater. On Southern iron quotations are, if anything, a little weaker, and the talk of $14, Birmingham, for No. 2 as a basis is no longer heard. We quote for large lots, on dock, as follows: No. 1 foundry, $17.50@$17.75; No. 2, $17@$17.25; No. 3, $16.50@$16.75; No. 4, $16@$16.25; No. 1 soft, 17.50@$17.75; No. 2 soft, $17@$17.25; gray forge, $16@$16.25.

The warrant market on the Produce Exchange has been very quiet, and, owing to the holiday, hardly any business was done.

*Bars.*—Bar iron is easier, with only moderate demand, quotations for large lots being 1.645@1.745c. Steel bars are quoted at 1.645c. Store trade is fair, and prices are 1.75@2c. delivered.

*Plates.*—The demand for plate is in small lots. Tank plates are 1.745@1.845c.; flange and boiler, 1.845@1.945c.; universal and sheared plate are 1.645c. up, according to size.

*Structural Material.*—Structural material is selling in lots of moderate size. Beams under 15 in. are 1.745c. in large lots; over 15 in., 1.845c.; angles are 1.745c. Extra prices are charged for small lots.

*Steel Rails.*—The regular quotation continues $28 per ton at mill for standard sections. Very little business is done in this market. Light rails are quiet. Sales have been made as low as $24 for 12-lb. rails, while 25-lb. to 35-lb. can be had at $21, for large orders.

*Old Material.*—Demand is moderate only and prices lower. Railroad wrought is quoted $19@$19.50; yard wrought, $16@$16.50; machinery cast, which is not in as good supply as other kinds, remains $14@$15. Heavy steel melting scrap is $15.50@$16. These prices are on cars, Jersey City or other terminal delivery.

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**Philadelphia.** April 26.

*Pig Iron.*—There has been a sudden falling off in the demand for pig iron in eastern and middle Pennsylvania; at the same time there are standing inquiries, but the inquirers are not pushing negotiations. There are certain parties in this territory who would buy basic for late delivery if the prices suited, but they do not believe it is good policy to contract for large quantities of iron upon a premium market, when there are, as they think, increasing probabilities for a weakening tendency in prices later in the year. Our foundrymen are still in the way of buying special grades of foundry and our mill-men are picking up common iron where they find lots that suit them.

*Structural Material.*—There is an extraordinary demand for structural material, and more business is in sight than there is any possibility of placing to suit the necessities of buyers as to deliveries. Mill capacity is severely taxed, and small contractors who need lots ranging from 50 to 500 tons, and who have delayed placing orders, are now in a quandary.

*Steel Rails.*—Traction requirements throughout the country are quite an item this year, and there are in sight several large orders which will probably be placed this week or next.

*Scrap.*—There is an extraordinary demand for scrap, but the buying is irregular, owing to the strong prices named. The holders of scrap iron seem to have the advantage, and they are scouring the country for the kinds that are in most request. On some kinds of scrap 25c. higher is being asked, with but very little probability of concessions. The tone of the market could not be stronger, but it is a question whether the large scrap buyers will pay as much as $23.50 for railroad scrap. Phosphorus scrap is quoted at $23; No. 1 yard scrap, $21; No. 1 steel scrap, $18; No. 1 forge fire scrap, $16.50; old iron rails, $25 per ton.

**Pittsburg.** April 18.

Conditions in the iron and steel markets remain about the same as a week ago, but a little more new business has been booked. Sales of pig iron aggregate nearly 7,000 tons and there are a number of inquiries. It is reported that the United States Steel Corporation has opened negotiations for pig iron for May delivery and will close this week for probably 40,000 tons. Other steel interests are expected to come into the market for iron and it will be impossible to get a lower rate than $15.50, Valley furnaces, and a higher price may be asked. Shading of foundry iron prices has been reported, but none of the reports has been substantiated. The foundries are generally covered for this quarter, and in some cases for the third quarter, and large transactions in foundry iron are not expected. A sale of 500 tons of No. 2 was made by a Valley furnace at $16 a ton, which has been the minimum price for some time. Smaller lots of the same grade have sold at 25c. a ton or more. Basic iron commands as high a price as bessemer, and has been scarce for several weeks, owing to furnaces usually running on basic going on other grades. Forge iron is not in great demand, and, while there have been reports of cutting, the price seems to be firm at $15.85 Pittsburg, sales of several small lots having been made during the week at that figure.

Some surprise was occasioned this week by a stiff advance in pipe and boiler tubes ordered by the National Tube Co. The demand for pipe has been fair, but lately there has been cutting by independent concerns and it was believed the market was weakening. The leading interest has adhered strictly to the established prices and while lower prices were named by outsiders than conditions seemed to warrant it was not expected that any advance would be justified. The new rates just ordered call for an advance of one-half point on $1 a ton for pipe and two points, or $4 a ton, for boiler tubes. The new prices went into effect yesterday. Production in all lines of finished steel continues very heavy and there does not seem to be an accumulation of products in any line with the possible exception of sheets, tin-plate and wire. Can manufacturing concerns are well stocked with tin-plate. The American Sheet & Tin Plate Co. is still operating its plants to capacity, although some days several mills are off on account of breakages of machinery. A movement to consolidate the independent tin-plate interests is talked of, but there are no substantial grounds for the report except the purchase by independent interests of three important idle plants during the past few weeks. J. R. Phillips, former district manager for the leading producer, bought the eight-mill tin-plate plant at Clarksburg, and it is said will remove it to Ellwood, near New Castle, Pa. The identity of his associates in the enterprise has not been made public. Recently the Berger interests of Canton, O., bought the six-mill plant of the Junita Iron & Steel Co., at Greencastle, Ind. The dispute over the sale of the six-mill plant at Morgantown will be settled at the May term of the circuit court of West Virginia. John G. Frazer, representing a corporation law firm, was the purchaser, but George C. Sturgiss, a Morgantown attorney, has filed a protest that his bid had been accepted previous to the sale to Frazer. It is not known who the bidders represent in the matter, but Frazer declares he did not buy the plant fo rthe Steel Corporation. Orders for steel rails are coming in slowly, about 30,000 tons having been booked lately. The new rail mill of the Republic Iron & Steel Co., at Youngstown, will probably be in operation about the first of May. The first experimental run was made yesterday. The production for this year is not expected to be very large, and there will not be much difficulty in getting an allotment in the rail pool. The Republic steel plant will not be able to spare much steel for the rail mill, as it is well sold up. The company's shipment of billets, at the rate of 10,000 tons a month, to the Pittsburg Steel Co., will continue until July 1, and after that date it will ship 6,000 tons monthly. It is also shipping 4,500 tons to the Youngstown Iron Sheet & Tube Co. every month, on a conversion contract. A representative of the Maryland Steel Co., an underlying concern of the Pennsylvania Steel Co., with a plant at Sparrows Point, Md., has been in Pittsburg for several days, making inquiries for mill and blast furnace machinery, to be used in extensive improvements. It is expected that contracts will be placed, aggregating about $1,000,000. Announcement was made yesterday by the Manufacturers' Association of an advance in wages at about 60 foundries, machine shops and brass works of the members, effective on June 1. About 6,000 machinists, molders, patternmakers and brass workers will be affected. The wages of these workmen were reduced last July, and the advance ordered will more than restore the cut. An unusually prosperous outlook is assigned as the reason for the action.

*Pig Iron.*—Sales of all grades of pig iron during the week aggregate about 7,000 tons. Fully 5,000 tons of bessemer iron was sold at $15.50, Valley furnaces. Foundry No. 2 is quoted at $16.85@$17, Pittsburg and gray forge at $15.85, Pittsburg.

*Steel.*—Premiums are being paid for billets and sheet-bars. Ordinary billets are held at $24@$25, but small billets and forging billets are $2 and $3 a ton higher. The pool price remains unchanged at $21 for billets and $23 for sheet-bars. Plates are firm at 1.60c., and premiums are paid in some instances. Merchant steel bars are still quoted at 1.50c.

*Sheets.*—There is but little change in the sheet market. Some mills are behind in deliveries, and several independent concerns are reported to be shading prices to get business. The leading interest is adhering strictly to the price established, 2.40c. for black sheets, No. 28 gauge, and 3.45c. for galvanized.

*Ferro-Manganese.*—The big advance expected a few weeks ago has not come, and 80% domestic is quoted at $50@$51 per ton.

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**Cartagena, Spain.** April 8.

*Iron and Manganiferous Ores.*—Barrington & Holt report that the market has been quiet. Shipments for the week were one cargo (200 tons manganiferous ore), and two cargoes (6,400 tons dry ore) to Great Britain; one cargo (600 tons dry ore) to Philadelphia.

Prices are as follows, all f. o. b. shipping port: Ordinary 50% ore, 6s. 4d.@6s. 7d.; special low phosphorus, 7s.@7s. 8d.; specular ore, 58% iron, 9s. 4d. For manganiferous ores quotations vary from 10s. per ton for 35% iron and 12% manganese up to 14s. 7d. for 20% iron and 20% manganese.

## Chemicals and Minerals.

NEW YORK, April 26.

Deliveries are seasonably good and prices firm. Some good-sized contracts for caustic soda have been booked at $1.75@$1.80 per 100 lb., f. o. b. works, and of alkali at 75@80c., future shipment. Other large purchases have also been made by the oil refiners and glass works. In raw materials the situation is peculiar; domestic producers of brimstone, by lowering prices, have intensified competition with the Sicilian combination; pyrite shows a heavy import movement; the shortage in the visible supply of crude saltpeter has raised quotations to a record level, and phosphates are strong, as a result of the increase in consumption.

The foreign trade of Great Britain in the three months ending March 31 is shown below:

| | Exports. | Imports. |
|---|---|---|
| Borax, lb. | ..... | 6,031,536 |
| Brimstone, tons | ..... | 5,174 |
| Chemical manures, tons. | 119,867 | ..... |
| Copper sulphate, tons | 28,022 | ..... |
| Muriate of ammonia, lb. | 2,470,608 | 159,264 |
| Nitrate of soda, tons | 3..... | 32,439 |
| Phosphates, tons | ..... | 100,211 |
| Pyrite, tons. | ..... | 185,669 |
| Salt, tons. | 118,598 | ..... |
| Saltpeter, lb | ..... | 7,227,712 |
| Sulphuric acid, lb. | 2,878,496 | 892,236 |

*Copper Sulphate.*—The market is quiet and prices are unchanged at $4.75@$5 per 100 pounds.

*Acids.*—The season is fast approaching when sulphuric and muriatic acids will show larger shipments. Fortunately for acid makers, brimstone is cheaper, but the strength of nitrate of soda has caused some alarm, especially as present prices are far above the average of recent years, and are likely to continue so for some time.

| | |
|---|---|
| **Nitric acid, 36°, 100 lb.** | **$5.00** |
| **38°, 100 lb.** | **5.25** |
| **40°, 100 lb.** | **5 50** |
| **42°, 100 lb.** | **5.75** |
| **Oxalic acid, com'l, 100 lb.** | **$5.00@ 5.25** |
| **Sulphuric acid, 50°, bulk, ton** | **13.50@14.50** |
| **60°, 100 lb. in carboys** | **1.05** |
| **60°, bulk, ton** | **18.00@20.00** |
| **66°, 100 lb. in carboys** | **1.20** |
| **66° bulk, ton** | **21.00@23.00** |

*Sulphur and Pyrite.*—There is little occasion to comment on the position of either sulphur or pyrite, excepting that the tendency of prices for the former is downward, while the latter, favored by long time contracts, remains firm. According to the latest advices from Sicily, the f. o. b. price of best unmixed seconds brimstone in bulk is 80s. ($19.20), and, adding the freight of $1.80, makes the c. i. f. quotation $21, not taking into account, however, agents' commission or expenses incidental to importation. Domestic prime sulphur is quoted at $21 per ton, f. o. b. New York, $21.50 at Baltimore and Philadelphia, and $21.25 at Portland, Maine. So-called 'seconds' are worth 30c. per ton less than prime. Dealers in pyrite are doing little new business just now, but deliveries on running contracts are seasonably good. It is learned that the Tharsis Sulphur & Copper Co., of Spain, shipped last year 426,078 tons of pyrite (including unwashed mineral), which compares with 421,226 tons in 1903. For foreign pyrite, f. o. b. Atlantic ports, quotations are: Unwashed lump ore, 10.5@11c. per unit of sulphur (varying from 48@52%); washed lump, 10@10.5c.; broken to furnace size, 25c. per ton extra; unwashed fines, 9.5@10c.; washed fines, 8@8.5c. Domestic pyrite, f. o. b. Atlantic coast mines, containing 38@46% sulphur, is quoted at 9@10c. per unit for lump, and 8.5@9.5c. for fines.

*Nitrate of Soda.*—The market continues firm at $2.50 per 100 lb. for refined quality on spot, and $2.225@$2.30 for futures. Ordinary grade is worth 2.5@5c. per 100 lb. less than refined.

*Chilean Nitrate of Soda Market.*—Messrs. Jackson Brothers, of Valparaiso, write under date of March 18, that the market has been very dull throughout the fortnight, and in absence of any general demand, some sellers and also re-sellers have shown a disposition to accept lower prices. Since our last quotation of 7s. 4½d., small parcels of 95% for March-April, deliveries have changed hands down to 7s. 2½d., and for July-December at 7s. 3½d.. In the refined quality little has been done; at the commencement of the fortnight a chance sale for April delivery was effected at 7s. 10½d., but now 7s. 8d. would not be obtained. We quote 95%, March-June 7s. 2½d., and July-December, 7s. 3d., both alongside sellers. The price of 7s. 2d. alongside with an all-round freight of 20s. stand in 8s. 11½d. per cwt., net, cost and freight without purchasing commission.

*Sulphate of Ammonia.*—A few orders have been placed for domestic gas liquor at $3.07@$3.10 per 100 lb., late delivery, and at the close spot and early shipments are quoted at $3.15@$3.17. Foreign, influenced by the position of the Continental consumptoin, which shows some variation, is quoted at $3.17½@$3.18.

The German Sulphate of Ammonia Sales Syndicate reports its deliveries in 1904 at 82,702 tons, of which 7,200 tons were exported. In 1903 the total shipments were 64,675 tons, of which 3,000 tons went abroad. The consumption of high strength ammonia liquor in 1904 was 5,896 tons, of weak liquor 18,993 tons. Imports in 1904 were 35,165 tons, of which Great Britain furnished 17,680 tons (against 19,000 tons in 1903), and Austria, 12,300 tons. Domestic production in 1904 showed a large increase, the Bochum district reporting 83,400 tons, which compares with 65,000 tons in 1903. This increase is credited to the erection of new by-product coke ovens, the result of energetic propaganda work by the sulphate of ammonia syndicate among agriculturists.

*Saltpeter.*—The market is particularly strong, crude being quoted at $4.25@$4.50 per 100 lb., acocrding to position. Refined is worth $4.50@$5.

*Phosphates.*—Deliveries are principally on renewal contracts, taken at an advance in price. Future shipments will undoubtedly be made at better prices, as the consumption of superphosphates is steadily increasing, France alone showing an improvement of over 55% in the past five years. In 1904 France consumed 1,400,000 metric tons of superphosphate. In Germany the fertilizer industry has been improved by the suspension of competition as the result of the new working agreement signed by the various manufacturers. There are still, however, a few large independent dealers in the Hanover-Saxony district who, inspired by their success in breaking the fertilizer syndicates in 1901, seem determined to fight again. Germany is probably the largest manufacturer of fertilizers in Europe, and is the best customer for American phosphates, hence the interest shown in trade combinations in that country. Another attempt is being made to interest American phosphate exporters in Spanish trade. The imports of phosphates into Spain amount annually to 30,000 or 35,000 tons, to be increased next year to 50,000 tons. A large part of these imports is from Africa, phosphates which carry 58@70% B.P.L., and cost much less than American. Moreover, the ocean freight from Algeria or Tunis to Spain is only about one-half the rate from America. On the other hand, Spain taxes imports of guano and other natural or artificial manures at 4c. per 100 kg. (40c. per metric ton).

Reports from Christmas Island state that the mortality of coolie labor from the disease known as beri-beri is high, amounting last year to 154.88 per 1,000. Still the phosphate mines are being actively worked, and in 1904 shipped 71,757 tons, of which 30,771 tons were classed as 'dried,' and 40,986 tons as 'undried' mineral. The largest importers were Japan, Germany and Sweden.

Superphosphates are generally higher in the European market, but in America prices remain unchanged. Abroad the market demands a higher grade than here. As much of the phosphate consumed in America is rather low-grade, the quality of superphosphate marketed varies from 13 to 16%, as against 25 to 36% manufactured in Germany and France. Below we quote for the first time prices for the various grades of superphosphates:

| Phosphates. | F. o. b. | C. I. F. Gt. Britain or Europe. |
|---|---|---|
| *Fla., hard rock | $7.25@7.50 | $10.67@11.85 |
| land pebble | 3.75@4.00 | 7.70@ 8.40 |
| †Tenn., 78@80% | 4.35@4.40 | 10.27@10.67 |
| 78% | 3.75@4 00 | ..... |
| 75% | 3.40@3.50 | ..... |
| 68@72% | 3.00@3.25 | ..... |
| ‡So. Car. land rock | 3.75@4 00 | ..... |
| river rock | 3.50@3.75 | 6.33@ 6.61 |
| Algerian, 63@70% | ..... | 7.04@ 7.71 |
| 58@63% | ..... | 6.15@ 6.60 |
| Tunis (Gafsa) | ..... | 6.00@ 6.60 |
| Christmas Isle | ..... | 13.28@14.11 |
| Ocean Isle | ..... | 13.60@14.45 |
| Somme, Fr | ..... | 11.39 |
| Basic slag, 42@50% | ..... | 10.21@10.44 |
| 38@45% | ..... | 9.48@ 9.72 |
| 30@35% | ..... | 7.62@ 7.98 |
| §Superphosphate, 14@16% | ..... | 6.40@ 9.60 |
| 25@27% | ..... | 9.72@10.20 |
| 30@31% | ..... | 10.92@11.40 |
| 35@36% | ..... | 13.32@13.80 |

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C. §Low-grade superphosphate is domestic, f. o. b. New York; high-grade, foreign, c. i. f Continental ports.

## Metal Market.

New York, April 26.

### Gold and Silver Exports and Imports.

At all United States Ports in March and Year.

| Metal. | March. | | Year. | |
|---|---|---|---|---|
| | 1904. | 1905. | 1904. | 1905. |
| G'ld Exp | $3,063,458 | $2,391,884 | $4,387,639 | $34,014,364 |
| Imp | 8,855,162 | 5,133,592 | 22,115,042 | 9,222,202 |
| Exc | I. $5,791,704 | I. $2,741,708 | I.$17,727,403 | E$24,792,162 |
| Silv Exp | 4,098,823 | 4,191,632 | 13,026,294 | 12,592,452 |
| Imp | 2,108,356 | 2,531,796 | 6,824,403 | 6,515,356 |
| Exc | E. $1,990,467 | E. $1,659,836 | E. $6,201,891 | E. $6,077,096 |

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

### Gold and Silver Exports and Imports, N.Y.

For the week ending April 22 and for years from January 1.

| Period. | Gold. | | Silver. | |
|---|---|---|---|---|
| | Exports. | Imports. | Exports. | Imports. |
| Week... | $490,037 | $302,136 | $344,751 | $22,309 |
| 1905.... | 32,440,807 | 4,486,176 | 10,382,749 | 1,136,984 |
| 1904.... | 8,306,449 | 1,607,438 | 14,277,952 | 260,969 |
| 1903.... | 1,347,450 | 2,527,448 | 5,787,204 | 387,534 |

Gold exports this week were principally to the West Indies; imports chiefly from France. Silver exports were mostly to London; imports largely from Central America.

The reaction in the speculative markets this week seems to have had very little effect on general business. The fact is that stock operations, and those in grain have been carried on mainly among the so-called insiders or professional speculators, and the general public has been very little in evidence in the market.

The statement of the New York banks—including the 53 banks represented in the Clearing House—for the week ending April 22, gives the following totals, comparison being made with the corresponding week of 1904:

| | 1904. | 1905. |
|---|---|---|
| Loans and discounts | $1,046,390,300 | $1,107,294,900 |
| Deposits | 1,109,374,400 | 1,151,968,600 |
| Circulation | 35,725,000 | 44,433,200 |
| Specie | 236,157,500 | 216,116,900 |
| Legal tenders | 75,389,800 | 83,323,300 |
| Total reserve | $311,547,300 | $299,440,200 |
| Legal requirements | 277,343,600 | 287,992,150 |
| Balance surplus | $34,203,700 | $11,448,050 |

Changes for the week this year were increases of $7,683,800 in loans and discounts, $12,266,600 in deposits, $25,300 in circulation, $5,162,100 in specie, $200 in legal tender and $2,095,650 in surplus reserve.

The silver market has ruled quiet and dull during the Easter holidays. The tendency, however, has been fairly firm.

The United States Assay Office in New York reports receipts of 61,000 oz. of silver for the week.

Shipments of silver from London to the East for the year up to April 13 are reported by Messrs. Pixley & Abell's circular as follows:

| | 1904. | 1905. | Changes. |
|---|---|---|---|
| India | £3,720,289 | £2,354,290 | D. £1,365,999 |
| China | 71,000 | 8,070 | D. 62,930 |
| Straits | 58,103 | 2,800 | D. 55,303 |
| Totals | £3,849,392 | £2,365,160 | D. £1,484,232 |

Receipts for the week were £178,000 in bar silver from New York. Shipments were £39,400 in bar silver to Bombay and £35,000 to Calcutta, a total of £74,400.

Indian exchange is much easier, as the demand for money in the presidencies has been light. Moreover, exports are falling off, and the crop prospects are not particularly good. The Council bills offered in London were sold at an average of 15.97d. per rupee. Buying of silver for Indian account has been rather light.

The movement of gold in Great Britain for the three months ending March 31, is reported as follows:

| | 1904. | 1905. |
|---|---|---|
| Imports | £9,460,071 | £11,400,817 |
| Exports | 8,215,505 | 5,934,072 |
| Excess, imports | £1,244,566 | £5,466,745 |

The increase of £1,940,746 in imports, with a decrease of £2,281,433 in exports, left a net gain of £4,222,179 for the quarter.

The movement of silver in Great Britain for the three months ending March 31 was as follows:

| | 1904. | 1905. |
|---|---|---|
| Imports | £3,693,036 | £3,410,559 |
| Exports | 4,003,828 | 3,769.642 |
| Excess, exports | £310,522 | £359,083 |

Of the silver imported this year, a total of £2,453,496, or 72.1% of the whole, was from the United States.

### Prices of Foreign Coins.

| | Bid. | Asked |
|---|---|---|
| Mexican dollars | $0.44½ | $0.48½ |
| Peruvian soles and Chilean pesos | .40½ | .44½ |
| Victoria sovereigns | 4.85 | 4.87 |
| Twenty francs | 3.87 | 3.90 |
| Spanish 25 pesetas | 4.78 | 4.82 |

### Other Metals.

Daily Prices of Metals in New York.

| | Copper. | | | Tin. | Lead. | Spelter. | |
|---|---|---|---|---|---|---|---|
| April. | Lake, Cts. per lb. | Electrolytic Cts. per lb. | London, £ per ton. | Cts. per lb. | Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 20 | 14¾ @15 | 14¾ @14¾ | 67 | 30½ | 4.50 | 5.75 @5.80 | 5.60 @5.65 |
| 21 | 14¾ @15 | 14¾ @14¾ | ..... | 30½ | 4.50 | 5.75 @5.80 | 5.60 @5.65 |
| 22 | 14¾ @15 | 14¾ @14¾ | ..... | 30½ | 4.50 | 5.75 @5.80 | 5.60 @5.65 |
| 24 | 14¾ @15 | 14¾ @14¾ | ..... | 30¾ | 4.50 | 5.75 @5.80 | 5.60 @5.65 |
| 25 | 14¾ @15 | 14¾ @14¾ | 66½ | 30¾ | 4.50 | 5.75 @5.80 | 5.60 @5.65 |
| 26 | 14¾ @15 | 14¾ @14¾ | 66½ | 30½ | 4.50 | 5.75 @5.80 | 5.60 @5.65 |

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. Cathodes are usually 0.25c. below the price of electrolytic copper.

SILVER AND STERLING EXCHANGE.

| | | Silver. | | | | Silver. | |
|---|---|---|---|---|---|---|---|
| April. | Sterling Exchange. | New York. Cents. | London. Pence. | April. | Sterling Exchange. | New York. Cents. | London. Pence. |
| 20 | 4.86½ | 57 | 26 5/16 | 24 | 4.86½ | 57 | ..... |
| 21 | 4.86½ | 57 | ..... | 25 | 4.8615 | 57¼ | 26 7/16 |
| 22 | 4.86½ | 57 | ..... | 26 | 4.8620 | 57 | 26 5/16 |

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver. .925 fine.

*Copper.*—There has been an entire absence of demand both from domestic and foreign sources during the week under review. On this account a number of lots of lake and electrolytic copper, which were forced for sale, had an altogether disproportionate influence on prices. However, as the statistical position is sound and business in all lines continues at a very satisfactory rate, it is generally believed that the market will soon become active. The closing quotations are lower at 14⅞@15c. for lake copper; 14¾@14⅞c. for electrolytic in ingots, cakes and wirebars, 14½@14⅝c. in cathodes; 14⅜@14½c. for casting copper.

The London market has also declined somewhat further, the closing quotations on Wednesday being cabled as £66 2s. 6d. for spot, £66 7s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £70 10s.@£71; best selected, £71 15s.@£72 5s.; strong sheets, £79 10s.; India sheets, £75 10s.; yellow metal, 6⅝d.

Imports and exports of copper and copper material in Great Britain for the three months ending March 31 were as follows, in long tons, the totals giving the contents of all material in fine copper:

| | 1904. | 1905. | Changes |
|---|---|---|---|
| Copper ore | 21,664 | 24,872 | I. 3,208 |
| Matte and precipitate | 12,528 | 15.046 | I. 2,518 |
| Fine copper | 24,397 | 19,698 | D. 4,699 |
| Total, fine copper | 32,827 | 29,708 | D. 3,119 |
| Exports | 12,622 | 9,402 | D. 3,220 |
| Net imports | 20,205 | 20,306 | I. 101 |

Of the imports this year, 40 tons of ore, 1,072 tons of matte and 9,679 tons of fine copper were from the United States, against 3 tons of ore, 1,532 tons of matte and 14,354 tons of fine copper last year.

Exports of copper from New York and Baltimore for the week ending April 25 were 4,077 long tons. Imports for the week of April 21 were 100 tons copper, and $16,439 worth of ore (quantity not given).

*Tin.*—The market is very much weaker, and, as a still further decline is expected, business has been very much restricted, consumers buying only from hand to mouth. Quotations at the close are 30¼c. for spot, 29¾@29⅞c. for futures.

The foreign market, which closed last week at £140 2s. 6d. for spot, £135 for three months, opened on Tuesday at £140 for spot, £135 for three months, and the closing quotations on Wednesday are lower at £138 5s. for spot, £134 10s. for three months.

Imports of tin into Great Britain, with re-exports of imported metal, for the three months ending March 31, were as follows, in long tons.

| | 1904. | 1905. | Changes. |
|---|---|---|---|
| Straits | 5,743 | 8,365 | I. 2,622 |
| Australia | 1,071 | 876 | D. 195 |
| Other countries | 850 | 315 | D. 535 |
| Total imports | 7,664 | 9,556 | I. 1,892 |
| Re-exports | 5,421 | 7,373 | I. 1,952 |
| Net imports | 2,243 | 2,183 | D. 60 |

The tin from other countries is in large part Bolivian tin. A large part of the re-exports are to the United States.

*Lead.*—The condition of the market is entirely unchanged, both with respect to the general business and prices. The closing quotations are 4.42½c. St. Louis, 4.50c. New York.

The market abroad is also practically unchanged, the closing quotations being cabled as £12 11s. 3d. for Spanish lead, £12 13s. 9d. for English lead.

Imports and exports of lead in Great Britain for the three months ending March 28 are reported as follows, in long tons:

| | 1904. | 1905. | Changes. |
|---|---|---|---|
| United States | 8,214 | 4,971 | D. 3,243 |
| Spain | 25,846 | 25,394 | D. 452 |
| Australia | 16,830 | 24,864 | I. 8,034 |
| Germany | 3,621 | 3,688 | I. 67 |
| Other countries | 1,083 | 574 | D. 509 |
| Total imports | 55,594 | 59,491 | I. 3,897 |
| Exports | 9,486 | 9,755 | I. 269 |
| Balance, imports | 46,108 | 49,736 | I. 3,628 |

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

*St. Louis Lead Market.*—The John Wahl Commission Co. telegraphs us as follows: Lead is quiet but steady. The price remains 4.50@4.52½c. for Missouri lead, according to brand and delivery.

*Spanish Lead Market.*—Barrington & Holt report from Cartagena, Spain, under date of April 8, that silver has been 13.50 reales per oz. Local quotation for lead has been 67.75 reales per quintal, which, on current exchange, is equal to £11 8s. 5d. per long ton, f. o. b. Cartagena. Exports were 64 tons desilverized to Marseilles, 150 tons desilverized to Amsterdam, and 30 tons antimonial lead to Hamburg.

*Spelter.*—There has been a little more business at the reduced prices, and the opinion appears to prevail that bottom has been reached. The closing quotations are 5.60@5.65c. St. Louis, 5.75@5.80c. New York.

The foreign market is unchanged, the quotations at the close being £24 for good ordinaries, £24 5s. for specials.

Imports of spelter into Great Britain, with exports of the metal, for the three months ending March 31, are reported as follows, in long tons:

| | 1904. | 1905. | Changes. |
|---|---|---|---|
| Spelter | 22,275 | 21,925 | D. 350 |
| Zinc sheets, etc. | 5,580 | 4,525 | D. 1,055 |
| Total, imports | 27,855 | 26,450 | D. 1,405 |
| Exports | 1,820 | 2,057 | I. 237 |
| Balance | 26,035 | 24,393 | D. 1,642 |

Imports of zinc ores are not given separately in the returns.

*St. Louis Spelter Market.*—The John Wahl Commission Co. telegraphs us as follows: Spelter is very quiet. The latest sales are on a basis of 5.72½@5.75c., East St. Louis.

*Spanish Zinc Ore Market.*—Barrington & Holt report from Cartagena, Spain, under date of April 8, that stocks are well sold out, and prices continue firm at 74 fr. per ton for blende, 35%, and 54 fr. for calamine, 30% zinc. Shipments were 2,100 tons blende to Bordeaux.

*Antimony* is very firm, and common brands are selling at around 8⅜@8⅝c., f. o. b. New York.

*Nickel.*—Producers quote 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. For smaller quantities as high as 60c. is asked.

*Platinum.*—Quotations are firm at $20.50 per oz. Gas engine sparking points vary from 87c. each for "A," to $1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated ware, 90c., and cones, $1 per gram.

*Quicksilver.*—Quicksilver is easy, at $38 @$38.50 per flask in large lots, while $40 is the price for smaller orders. San Francisco prices are $37.50@$39 per flask for domestic orders, with some discount for export. The London price is £7 12s. 6d., with the same figures quoted by second hands.

Imports of quicksilver into Great Britain from January to March were 1,206,430 lb. in 1904, and 1,149,028 lb. in 1905, a decrease of 57,402 lb. Re-exports of foreign quicksilver were 464,499 lb. in 1904, and 492,895 lb. in 1905, an increase of 28,396 lb. this year.

*Cadmium.*—Metallic cadmium, guaranteed 99.5%, is selling in quantities of 100 kgs. or over at 710 marks per 100 kgs., packing included, f. o. b. Hamburg. This is equivalent to 76.6c. per lb. Prices are for net cash.

*Minor Metals and Alloys.*—Prices for manganese alloys in Germany are given by Herr Paul Speier as below. The prices are for orders of not less than 500 kgs., delivered in Bremen, and are as follows, per 100 kgs.: Manganese copper, No. 1, guaranteed 30% manganese, 265 marks; No. 2, 28 to 30% manganese, for bronze, etc., 175 marks; No. 3, 25 to 20% manganese, with

2 to 4% iron, 165 marks. Manganese tin, No. 1, free of iron and guaranteed 55% manganese, 365 marks; No. 2, 55% manganese, with some iron, 225 marks. Manganese nickel, No. 1, free of iron, 450 marks; No. 2, carrying some iron, 270 marks.

Thalium is quoted at 60@65 marks per kg. at Breslau, Germany. Manganese metal is quoted at 360 marks per 100 kg., f. o. b. Bremen, Germany.

For other minor metals and their alloys, wholesale prices are, f. o. b. works:

| | Per lb. |
|---|---|
| Aluminum. | |
| No. 1, 99% ingots | 33@37c. |
| No. 2, 99% ingots | 31@34c. |
| Rolled Sheets | 4c. up. |
| Aluminum-Bronze | 20@23c. |
| Nickel-alum | 33@39c. |
| Bismuth | $2.10 |
| Chromium, pure (N. Y.) | 80c. |
| Copper, red oxide | 50c. |
| Ferro-Molybdenum (50%) | $1.00 |
| Ferro-Titanium (20@25% N. Y.) | 75c. |
| Ferro-Chrom. (74%) | 12½c. |
| Ferro-Tungsten (37%) | 45c. |
| Magnesium, pure (N. Y.) | $1.60 |
| Manganese (98@99% N. Y.) | 75c. |
| Manganese Cu. (30@70% N. Y.) | 40c. |
| Molybdenum (98@99% N. Y.) | $2.75 |
| Tantalic acid (N. Y.) | 50c. |
| Phosphorus, foreign | 45c. |
| Phosphorus, American | 70c. |
| Tungsten (best) | $1.25 |

Variations in prices depend chiefly upon the size and conditions of orders.

## Missouri Ore Market.

JOPLIN, April 22.

The highest price for zinc ore, $48 per ton, was an advance of $2 per ton, and the assay basis price advanced in isolated instances as much as $2.50 per ton, the general advance being $1.50—last week's price being $43.50, and this week's price $45 per ton of 60% zinc. Advance purchases at the latter end of last week contributed no small share to the advanced prices this week, as some of the buyers in coming into the market at the middle and latter part of this week for ore, for immediate delivery, found a small and widely scattered supply to select from, with several anxious buyers needing it to make up their average purchases for this week. The natural sequence was a little spirited bidding on Friday for ore for immediate shipment. Then the buyer who took up all the choice ore he could get last week for this week's delivery saved several dollars per ton on his purchases, and in an attempt to secure from other smelters some of their regular supply assisted materially in putting the price higher. Lead ore price was unchanged.

Following are the shipments for the week:

| | Zinc, lb. | Lead, lb. | Value. |
|---|---|---|---|
| Carterville and Webb City | 2,877,170 | 780,120 | $84,480 |
| Joplin | 2,545,400 | 268,220 | 63,780 |
| Duenweg | 721,340 | 126,180 | 19,530 |
| Galena-Empire | 769,990 | 115,720 | 18,750 |
| Badger | 760,860 | 4,440 | 16,110 |
| Zincite | 643,700 | 4,050 | 14,280 |
| Aurora | 672,000 | 24,820 | 13,370 |
| Granby | 505,000 | 75,000 | 12,200 |
| Alba | 524,010 | ..... | 11,220 |
| Prosperity | 174,620 | 117,050 | 7,230 |
| Carthage | 271,000 | ..... | 5,960 |
| Oronogo | 222,650 | 9,110 | 4,970 |
| Baxter | 203,000 | 6,430 | 4,250 |
| Sherwood | 126,290 | ..... | 3,130 |
| Neck | 97,420 | ..... | 2,190 |
| Spurgeon | 137,250 | 3,260 | 1,450 |
| Beef Branch | 85,930 | 5,830 | 920 |
| Diamond | 38,750 | ..... | 850 |
| Totals | 11,376,380 | 1,550,280 | $284,670 |

Zinc value, the week, $239,735; 16 weeks, $3,469,970. Lead value, the week, $44,935; 16 weeks, $510,630. Sales, 16 weeks, zinc, 147,733,510; lead, 17,614,080; value, $3,980,600.

## Monthly Average Prices of Metals.

### SILVER.

| Month. | New York. 1904. | New York. 1905. | London. 1904. | London. 1905. |
|---|---|---|---|---|
| January | 57.055 | 60.690 | 26.423 | 27.930 |
| February | 57.592 | 61.023 | 26.665 | 28.047 |
| March | 56.741 | 58 046 | 26.164 | 26.794 |
| April | 54.202 | ..... | 24.974 | ..... |
| May | 55.430 | ..... | 25.578 | ..... |
| June | 55.673 | ..... | 25.644 | ..... |
| July | 58.095 | ..... | 26.760 | ..... |
| August | 57.806 | ..... | 26.591 | ..... |
| September | 57.120 | ..... | 26.349 | ..... |
| October | 57.923 | ..... | 26.760 | ..... |
| November | 58.453 | ..... | 26.952 | ..... |
| December | 60.563 | ..... | 27.930 | ..... |
| Year | 57.221 | ..... | 26.399 | ..... |

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

### COPPER IN NEW YORK.

| Month. | Electrolytic. 1904. | Electrolytic. 1905. | Lake. 1904. | Lake. 1905. |
|---|---|---|---|---|
| January | 12 410 | 15.008 | 12.553 | 15.128 |
| February | 12.063 | 15.011 | 12.245 | 15.136 |
| March | 12.299 | 15.125 | 12.551 | 15.250 |
| April | 12.923 | ..... | 13.120 | ..... |
| May | 12.758 | ..... | 13.000 | ..... |
| June | 12.269 | ..... | 12.399 | ..... |
| July | 12.380 | ..... | 12.505 | ..... |
| August | 12.343 | ..... | 12.468 | ..... |
| September | 12.495 | ..... | 12.620 | ..... |
| October | 12.993 | ..... | 13.118 | ..... |
| November | 14.284 | ..... | 14.456 | ..... |
| December | 14.661 | ..... | 14.849 | ..... |
| Year | 12.823 | ..... | 12.990 | ..... |

Prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars; cathodes are usually 0.25c lower.

### COPPER IN LONDON.

| Month. | 1904. | 1905. | Month. | 1904. | 1905. |
|---|---|---|---|---|---|
| Jan | 57.500 | 68.262 | July | 57.256 | ..... |
| Feb | 56.500 | 67.963 | August | 56.952 | ..... |
| March | 57.321 | 68.174 | Sept. | 57.645 | ..... |
| April | 58.247 | ..... | Oct. | 60.012 | ..... |
| May | 57.321 | ..... | Nov. | 65.085 | ..... |
| June | 56.398 | ..... | Dec. | 66.384 | ..... |
| | | | Av., year. | 58.857 | ..... |

Prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

### TIN IN NEW YORK.

| Month. | 1904. | 1905. | Month. | 1904. | 1905. |
|---|---|---|---|---|---|
| Jan | 28.845 | 29.325 | July | 26.573 | ..... |
| Feb | 28.087 | 29.262 | August | 27.012 | ..... |
| March | 28.317 | 29.523 | Sept. | 27.780 | ..... |
| April | 28.132 | ..... | Oct. | 28.596 | ..... |
| May | 27.718 | ..... | Nov. | 29.185 | ..... |
| June | 26.325 | ..... | Dec. | 29.286 | ..... |
| | | | Av., year. | 27.986 | ..... |

### LEAD IN NEW YORK.

| Month. | 1904. | 1905. | Month. | 1904. | 1905. |
|---|---|---|---|---|---|
| Jan | 4.347 | 4.552 | July | 4.192 | ..... |
| Feb | 4.375 | 4.450 | August | 4.111 | ..... |
| March | 4.475 | 4.470 | Sept. | 4.200 | ..... |
| April | 4.475 | ..... | Oct. | 4.200 | ..... |
| May | 4.423 | ..... | Nov. | 4.200 | ..... |
| June | 4.496 | ..... | Dec. | 4.600 | ..... |
| | | | Av., year. | 4.309 | ..... |

### SPELTER.

| Month. | New York. 1904. | New York. 1905. | St. Louis. 1904. | St. Louis. 1905. |
|---|---|---|---|---|
| January | 4.863 | 6.190 | 4.673 | 6.032 |
| February | 4.916 | 6.139 | 4.717 | 5.989 |
| March | 5.057 | 6.067 | 4.841 | 5.917 |
| April | 5.219 | ..... | 5.038 | ..... |
| May | 5.031 | ..... | 4.853 | ..... |
| June | 4.760 | ..... | 4.596 | ..... |
| July | 4.873 | ..... | 4.723 | ..... |
| August | 4.866 | ..... | 4.716 | ..... |
| September | 5.046 | ..... | 4.896 | ..... |
| October | 5.181 | ..... | 5.033 | ..... |
| November | 5.513 | ..... | 5.363 | ..... |
| December | 5.872 | ..... | 5.720 | ..... |
| Year | 5.100 | ..... | 4.931 | ..... |

## Dividends.

| Company. | Payable. | Rate. | Amount. |
|---|---|---|---|
| Alaska-Treadwell | Apr. 28 | $0.50 | $100,000 |
| †Amalgamated Copper | May 29 | 1.00 | 1,530,877 |
| ‡Anaconda Copper | May 18 | .75 | 900,000 |
| *Annie Laurie | Apr. 15 | .50 | 12,500 |
| Butters' Salvador | Apr. 13 | .25 | 37,500 |
| *Claremont Oil, Cal | May 1 | .01 | 4,500 |
| Camp Bird, Colo | May 6 | .18 | 147,600 |
| *Central Eureka, Cal | May 8 | .07 | 5,000 |
| *Central Lead, Mo | Apr. 28 | .50 | 5,000 |
| †Doe Run Lead, Mo | Apr. 15 | 1.50 | 22,500 |
| *Dos Estrellas, Mex | Apr. 15 | 13.73 | 41,190 |
| El Paso, Colo | Apr. 25 | .02 | 50,000 |
| Esperanza, Mex | May 15 | .12 | 54,600 |
| Grand Central, Utah | Apr. 15 | .05 | 12,500 |
| §Greene Con. Gold, Mex | May 20 | .20 | 100,000 |
| §Greene Con. Copper | Apr. 21 | .40 | 345,600 |
| *Hecla, Ida | Apr. 20 | .01 | 10,000 |
| *Homestake, S. D | Apr. 25 | .50 | 109,200 |
| *Imperial Oil, Cal | May 6 | .20 | 20,000 |
| Iron Silver, Colo | May 1 | .10 | 50,000 |
| †Jamison, Cal | Apr. 18 | .03 | 11,700 |
| *Kendall, Mont | Apr. 20 | .05 | 25,000 |
| La Belle Iron Works, O | May 1 | 1.50 | 105,000 |
| *Lightner, Cal | Apr. 20 | .05 | 5,113 |
| *Mines Co. of Am | Apr. 20 | .01½ | 30,000 |
| *New Century Zinc & L | May 1 | .01 | 1,500 |
| New Central Coal, Md | May 1 | .40 | 20,000 |
| *N. Y. & Hond. Rosario | Apr. 22 | .10 | 15,000 |
| *Oil City Petroleum | Apr. 15 | .00½ | 2,500 |
| *Pacific Coast Borax | Apr. 29 | 1.00 | 19,000 |
| *Penna. Con., Cal | Apr. 15 | .10 | 5,150 |
| Penna. Salt | Apr. 15 | 3.00 | 118,000 |
| Pennsylvania Steel, pf. | May 1 | 3.50 | 588,749 |
| *Peerless Oil, Cal | May 1 | .14 | 12,880 |
| †Phila. Gas, com. | May 1 | .75 | 398,888 |
| †Pittsburg Coal, pf. | Apr. 25 | 1.75 | 519,771 |
| †Pocahontas Coll'r's, pf. | May 1 | 1.50 | 22,500 |
| †Portland, Colo | Apr. 15 | .10 | 300,000 |
| Providencia, Mex | May 1 | .89 | 5,340 |
| †Rock Run Fuel Gas, Pa. | May 1 | 1.75 | ..... |
| *San Rafael, aviador | Apr. 19 | 12.18 | 14,616 |
| *San Rafael, aviado | Apr. 19 | 3.48 | 4,176 |
| Santa Maria de la Paz | Apr. 30 | 2.23 | 5,340 |
| *Silver King, Utah | Apr. 10 | .66⅔ | 100,000 |
| †Spearfish, S. D | Apr. 15 | .01½ | 22,500 |
| †Tenn. Coal & Iron, pf. | May 1 | 2.00 | 4,960 |
| †Tenn. C. & I., com | May 1 | 1.00 | 225,536 |
| *Thirty-three Oil, Cal | May 6 | .10 | 10,000 |
| Tonopah, Nev | Apr. 22 | .25 | 250,000 |
| ‡United Copper, pf. | May 15 | 3.00 | 150,007 |
| †United Gas Imp | Apr. 15 | 2.00 | 180,000 |
| †U. S. Steel, pf | May 8 | 1.75 | 6,305,497 |
| †United Zinc, pf | Apr. 15 | .75 | 14,667 |
| †Va.-CarolinaChem., pf. | Apr. 15 | 2.00 | 360,000 |
| Victoria y An., Mex | Apr. 29 | 2.23 | 5,563 |
| †Vindicator Con., Colo. | Apr. 25 | .03 | 33,000 |
| Work, Colo | May 15 | .00½ | 7,500 |

*Monthly. §Bi-monthly. †Quarterly. ‡Semi-Annually.

## Assessments.

| Company. | Delinq. | Sale. | Amt. |
|---|---|---|---|
| Alpha Con., Nev | May 4 | May 25 | .05 |
| Alta, Nev | May 17 | June 5 | .05 |
| Alta Sierra, Cal | Apr. 26 | May 17 | .30 |
| Bullion, Nev | May 23 | ..... | .05 |
| Caledonia, Nev | Apr. 19 | May 10 | .10 |
| Canfield, Cal | May 16 | June 14 | .10 |
| Centennial Copper, Mich | Aug. 10 | ..... | 2.00 |
| Chollar, Nev | May 10 | ..... | .10 |
| Con. Cal. & Va., Nev | May 18 | June 8 | .25 |
| Crown Point, Nev | May 17 | ..... | .10 |
| Diamond Creek, Cal | May 13 | ..... | .01½ |
| Emerald, Utah | May 14 | June 10 | .01½ |
| Golden West, Cal | Apr. 17 | May 13 | .01 |
| Grape Vine Cañon, Cal | May 8 | ..... | .02½ |
| Holland, Utah | Apr. 19 | May 8 | .04 |
| Joe Bowers, Utah | Apr. 29 | May 30 | .00½ |
| Juno, Utah | May 10 | May 31 | .00½ |
| Lady Washington Con., Nev | May 8 | May 25 | .05 |
| La Palma, Mex | May 6 | ..... | .04 |
| Loon Creek, Utah | Apr. 12 | May 12 | .00½ |
| Lower Mammoth, Utah | May 6 | May 22 | .05 |
| Mexican, Nev | Apr. 11 | May 2 | .15 |
| Mt. Diable, Nev | May 11 | ..... | .10 |
| Republic, Cal | May 3 | ..... | .02½ |
| Santa Rita, Cal | May 11 | ..... | .05 |
| Savage, Nev | Apr. 7 | Apr. 27 | .10 |
| Sierra Nevada, Nev | May 16 | June 5 | .15 |
| Socrates Con., Cal | May 1 | ..... | .02½ |
| South Columbus, Utah | Apr. 22 | May 10 | .01 |
| St. John Con., quicksilver | May 8 | ..... | .10 |
| Union Con., Nev | May 19 | June 8 | .15 |
| Yellow Jacket, Nev | Apr. 11 | May 16 | .10 |

## Colorado Springs (By Telegraph.)

| Company. | April 24. H. | April 24. L. | April 25. H. | April 25. L. |
|---|---|---|---|---|
| Anaconda | .16 | .14⅜ | .15⅞ | .15 |
| C. K. & N. | .12 | .10 | .12 | .10 |
| Cripple Creek Con. | .08¼ | .07⅞ | .08¼ | .08⅛ |
| Doctor Jack Pot | .03⅜ | .03¼ | .04 | .03⅜ |
| Elkton | .52 | .51½ | .51¾ | .51½ |
| El Paso | 2.17 | 2.14½ | 2.15 | 2.13½ |
| Isabella | .30 | .29 | .29 | .28½ |
| Moon Anchor | .05¼ | .05 | ..... | ..... |
| Old Gold | .05¼ | .05¼ | .05¼ | .05 |
| Portland | 2.13 | 2.10 | 2.13 | 2.11 |
| Vindicator Con | 1.05 | .87 | 1.05 | .95 |
| Work | .13½ | .13 | .13¼ | .13 |

# STOCK QUOTATIONS.

## Salt Lake City. April 15.

| Company. | Par Val. | High. | Low. | Share |
|---|---|---|---|---|
| Ajax | .... | 14¾ | 14¾ | 500 |
| Butler Liberal | $1 | 12¼ | 12 | 8,000 |
| Carisa | 1 | 14 | 11½ | 10,000 |
| Con. Mercur | .... | 36 | 36 | 800 |
| Daly | 20 | 2.40 | 2.40 | 50 |
| Daly-Judge | .... | 6.10 | 6.03 | 450 |
| Daly-West | .... | 14.25 | 14.25 | 20 |
| Little Chief | 1 | 3¼ | 3¼ | 3,000 |
| Lo. Mammoth | 25 | 15 | 14 | 2,200 |
| May Day | .... | 27½ | 21 | 82,500 |
| New York Bonanza | 1 | 79 | 54 | 46,786 |
| Sacramento | .... | 8 | 7½ | 3,000 |
| Silver Shield | .... | 33½ | 32 | 26,200 |
| Star Con | 1 | 11 | 11 | 2,000 |
| Tetro | 1 | 18 | 18 | 6,500 |
| Uncle Sam Con. | 1 | 34½ | 34 | 2,400 |
| United Bingham | .... | 14½ | 14 | 2,500 |
| Victor Con. | .... | 4 | 4 | 2,000 |
| Wabash | .... | 1.58 | 1.25 | 1,300 |
| Yankee Con | .... | 35½ | 35 | 200 |

Total sales, 200,406 shares.

## St. Louis, Mo.* April 22.

| Company. | Par Val. | Bid. | Ask. |
|---|---|---|---|
| Am. Nettie, Colo. | $10 | $0.10 | $0.25 |
| Center Creek | 10 | 1.40 | 1.90 |
| Central Coal & C. | 100 | 69.50 | 70.25 |
| Central C & C., Pf. | 100 | 79.00 | 80.00 |
| Central Lead, Mo | 100 | 120.00 | 150.00 |
| Columbia Lead Mo. | 10 | .25 | 1.75 |
| Con. Coal, Ill. | 100 | 31.75 | 33.00 |
| Doe Run Lead, Mo. | 100 | 117.50 | 120.00 |
| Granite Bimet., Mont. | 10 | .30 | .36 |
| St. Joe Lead, Mo. | 10 | 16.75 | 17.50 |

*By our Special Correspondent.

## Montreal.*

| Company. | Par Val. | High. | Low. |
|---|---|---|---|
| Dominion Coal | $100 | 82.87½ | 80.00 |
| Dominion Coal, Pf. | 100 | ..... | ..... |
| Dom. I. & St. | 100 | 23.00 | 22.62½ |
| Dom. I. & St., Pf. | 100 | 69.00 | 68.00 |
| Montreal Steel | 100 | ..... | ..... |
| Nova Scotia St. | 100 | 65.50 | ..... |
| N. S. Steel, Pf. | 100 | ..... | ..... |

*Montreal Stock Exchange.

## San Francisco.* April 20.

| Company. | Location. | Opening. H. | Opening. L. | Closing. H. | Closing. L. | Sales. |
|---|---|---|---|---|---|---|
| MacNamara | Nev. | .57 | .48 | .43 | .... | 22,800 |
| Mont. Tonopah | Nev. | 3.35 | 3.12½ | 3.45 | 3.37½ | 17,500 |
| Ton. Belmont | Nev. | 1.25 | .... | .... | .... | 2,500 |
| Ton. Midway | Nev. | ..... | ..... | ..... | ..... | ..... |
| Ton. Mg. Co | Nev. | ..... | ..... | ..... | ..... | ..... |
| Ton. North Star | Nev. | .55 | .51 | .54 | .48 | 86,200 |

* San Francisco & Tonopah Exchange.
Total sales, 129,000 shares.

## San Francisco (By Telegraph.)

| Company. | April 24 | April 25 |
|---|---|---|
| Belcher | .29 | .32 |
| Best & Belcher | 1.70 | 1.80 |
| Caledonia | .67 | .67 |
| Challenge Con. | .22 | .26 |
| Chollar | .29 | .20 |
| Confidence | .91 | .90 |
| Con. California & Virginia | 1.80 | 1.80 |
| Crown Point | .18 | .16 |
| Gould & Curry | .31 | .32 |
| Hale & Norcross | 2.50 | 2.60 |
| Mexican | 2.60 | 2.50 |
| Ophir | 11.35 | 11.25 |
| Overman | .22 | .23 |
| Sierra Nevada | .45 | .45 |
| Union Con. | .74 | .73 |
| Yellow Jacket | .31 | .31 |

## New York.

| Company. | Val. | Apr. 19 H. | Apr. 19 L. | Apr. 20 H. | Apr. 20 L. | *Apr. 21 H. | *Apr. 21 L. | *Apr. 22 H. | *Apr. 22 L. | Apr. 24 H. | Apr. 24 L. | Apr. 25 H. | Apr. 25 L. | Sales. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alice | $25 | 52 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100 |
| Amalgamated | 100 | 88½ | 86½ | 86½ | 82½ | ..... | ..... | ..... | ..... | 83 | 80½ | 84½ | 81½ | 589,535 |
| Anaconda | 25 | 31 | 30 | 30½ | 29½ | ..... | ..... | ..... | ..... | 29¹⁵⁄₁₆ | 29½ | 30¹⁵⁄₁₆ | 28½ | 7,000 |
| Best & Belcher | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Brunswick | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Caledonia | 1 | 69 | 68 | ..... | ..... | ..... | ..... | ..... | ..... | 68 | .... | 71 | 70 | 900 |
| Chollar | 2½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Confidence | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Consolidated Cal. & Va | 2½ | 1.70 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1.75 | 1.70 | 600 |
| Crown Point | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 18 | 17 | ..... | .... | 400 |
| Elkton Consolidated | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .54 | .... | 200 |
| Federal Mining and Smelting | 100 | ..... | ..... | 105 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 109 | .... | 300 |
| Preferred | 100 | 100½ | 99 | 99⅜ | 98½ | ..... | ..... | ..... | ..... | 99 | 97½ | 101 | 99 | 5,500 |
| Gould & Curry | 1 | ..... | ..... | 35 | 34 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 500 |
| Greene Consolidated Copper | 10 | 28⅜ | 28⅛ | 28⅛ | 27⅝ | ..... | ..... | ..... | ..... | 28 | 27 | 27⅛ | 27½ | 12,100 |
| Greene Consolidated Gold | 10 | 8⅛ | 8 | 7⅞ | 7⅞ | ..... | ..... | ..... | ..... | 7⅞ | 7⅞ | 7⅞ | 7⅞ | 7,900 |
| Hale & Norcross | 3 | ..... | ..... | 1.25 | 1.20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 200 |
| Homestake | 100 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .80 | .... | .79 | .... | 214 |
| Horn Silver | 20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Iron Silver | 20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Isabella | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 31 | .... | ..... | .... | 500 |
| Justice | 2 | ..... | ..... | .09 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 300 |
| Little Chief | 20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mexican | 3 | 2.30 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2.55 | .... | 2.55 | .... | 400 |
| Mollie Gibson | 5 | .05½ | .... | .06 | .05½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,000 |
| Ontario | 100 | 2.35 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 50 |
| Ophir | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1100 | .... | 100 |
| Overman | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Phoenix | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Portland | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2.20 | .... | ..... | ..... | 100 |
| Potosi | 1 | ..... | ..... | 16 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .21 | .... | 700 |
| Quicksilver | 100 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Quicksilver, pf. | 100 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Savage | 3 | ..... | ..... | 45 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 200 |
| Sierra Nevada | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Silver Hill | 1 | 68 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 200 |
| Standard | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1.80 | .... | 1.75 | 1.70 | 300 |
| Tennessee Copper | 25 | 28 | .... | 29 | ..... | ..... | ..... | ..... | ..... | .27 | .... | 26½ | 26 | 775 |
| Union Consolidated | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| United Copper common | 100 | 27 | 25½ | 26½ | 25½ | ..... | ..... | ..... | ..... | 27½ | 25 | 26½ | 25 | 31,500 |
| Utah | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Yellow Jacket | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

*Holiday. Total sales, 662,574 shares.

## Boston.

| Company. | Par Val. | *Apr. 19 H. | *Apr. 19 L. | Apr. 2 H. | Apr. 2 L. | *Apr. 21 H | *Apr. 21 L. | *Apr. 22 H. | *Apr. 22 L. | Apr. 24 H. | Apr. 24 L. | Apr. 25 H. | Apr. 25 L | Sales. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adventure Con | $25 | ..... | ..... | 4¼ | 3½ | ..... | ..... | ..... | ..... | 4 | .... | .4 | .... | 415 |
| Allouez | 25 | ..... | ..... | 19¼ | 19 | ..... | ..... | ..... | ..... | 20 | 18 | 20 | 19½ | 2,788 |
| Amalgamated | 100 | ..... | ..... | 86½ | 82½ | ..... | ..... | ..... | ..... | 82½ | 80⅛ | 84 | 81½ | 28,196 |
| Am. Z. L. & Sm | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Anaconda | 25 | ..... | ..... | 30½ | 30⅛ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 110 |
| Arcadian | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Arnold | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Ash Bed | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1⅛ | ..... | 50 |
| Atlantic | 25 | ..... | ..... | 15½ | 15 | ..... | ..... | ..... | ..... | 15 | .... | 15 | 14½ | 1,381 |
| Bingham Con | 50 | ..... | ..... | 34½ | 33 | ..... | ..... | ..... | ..... | 33 | 31½ | 33½ | 32½ | 7,375 |
| Bonanza Dev. Con | 10 | ..... | ..... | 60 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100 |
| Boston Con | 10 | ..... | ..... | 8⅛ | 8 | ..... | ..... | ..... | ..... | 8 | 7⅛ | 8⅛ | 7⅛ | 7,915 |
| Calumet & Hecla | 25 | ..... | ..... | 670 | 662 | ..... | ..... | ..... | ..... | 660 | 650 | 660 | 641 | 295 |
| Catalpa | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Centennial | 25 | ..... | ..... | 17½ | 17 | ..... | ..... | ..... | ..... | 17¼ | 17 | 18¼ | 17⅛ | 1,735 |
| Con. Mercur | 5 | ..... | ..... | .37 | .36 | ..... | ..... | ..... | ..... | .38 | .37 | .39 | .... | 1,750 |
| Continental Zinc | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Copper Range Con | 100 | ..... | ..... | 75 | 72½ | ..... | ..... | ..... | ..... | 73½ | 71 | 74 | 72 | 9,894 |
| Daly West | 20 | ..... | ..... | 14½ | 14 | ..... | ..... | ..... | ..... | 14½ | 14 | 14⅜ | 14½ | 1,141 |
| Elm River | 12 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2½ | .... | 100 |
| Franklin | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9 | ..... | ..... | ..... | 110 |
| Granby | 10 | ..... | ..... | 6⅛ | 5⅞ | ..... | ..... | ..... | ..... | 6 | 5⅞ | ..... | ..... | 1,036 |
| Greene Con. Copper | 10 | ..... | ..... | 28¼ | 27½ | ..... | ..... | ..... | ..... | 28 | 27⅜ | 28 | 27½ | 7,905 |
| Guanajuato Con. | 5 | ..... | ..... | 6¼ | 6⅛ | ..... | ..... | ..... | ..... | 5¼ | 5½ | 5⅞ | 5¼ | 475 |
| Isle Royale Con | 25 | ..... | ..... | 22 | 20½ | ..... | ..... | ..... | ..... | 22 | 20 | 24 | 21½ | 3,530 |
| Mass Con. | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9½ | 9 | 9¼ | 9½ | 630 |
| Mayflower | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Michigan | 25 | ..... | ..... | 13½ | 12½ | ..... | ..... | ..... | ..... | 12¾ | 11½ | 12¾ | 12¼ | 1,725 |
| Mohawk | 25 | ..... | ..... | 51½ | 49 | ..... | ..... | ..... | ..... | 50 | 49½ | 50 | 49 | 3,108 |
| Montana Coal & Coke | 25 | ..... | ..... | 3¾ | 3½ | ..... | ..... | ..... | ..... | ..... | ..... | 3½ | .... | 400 |
| National | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| New Idria | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Old Colony | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Old Dominion | 25 | ..... | ..... | 25¼ | 24 | ..... | ..... | ..... | ..... | 26 | 24½ | 25¾ | 24½ | 2,220 |
| Osceola | 25 | ..... | ..... | 97½ | 96 | ..... | ..... | ..... | ..... | 96½ | 92½ | 96½ | 94 | 4,085 |
| Parrot | 10 | ..... | ..... | 26¼ | 25 | ..... | ..... | ..... | ..... | 26⅛ | 25 | 25 | .... | 655 |
| Phoenix Con | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1⅞ | .... | 25 |
| Quincy | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100 | 99 | 100 | 99 | 190 |
| Rhode Island | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1⅞ | .... | 25 |
| Santa Fe | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1½ | .... | 150 |
| Shannon | 10 | ..... | ..... | 7 | 6¾ | ..... | ..... | ..... | ..... | 7 | 6¾ | 7⅛ | 7⅛ | 5,246 |
| Tamarack | 25 | ..... | ..... | 125 | 123 | ..... | ..... | ..... | ..... | 125 | .... | 120 | .... | 185 |
| Tecumseh | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 | .... | 210 |
| Tennessee | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Trinity | 25 | ..... | ..... | 9¼ | 9 | ..... | ..... | ..... | ..... | 9¼ | 8⅛ | 9 | 8⅛ | 2,880 |
| Union Copper Land | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| United Copper Co. | 100 | ..... | ..... | 26 | 24½ | ..... | ..... | ..... | ..... | 26½ | 25½ | 26½ | 25½ | 4,035 |
| United States | 25 | ..... | ..... | 31½ | 30½ | ..... | ..... | ..... | ..... | 31½ | 29½ | 32 | 30½ | 19,089 |
| U. S. Coal & Oil | 25 | ..... | ..... | 9½ | ..... | ..... | ..... | ..... | ..... | 9¼ | 9½ | 9⅜ | 9½ | 720 |
| Utah Con. | 5 | ..... | ..... | 43 | 42½ | ..... | ..... | ..... | ..... | 43¼ | 42½ | 43 | 42⅜ | 10,470 |
| Victoria | 25 | ..... | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4 | .... | 257 |
| Winona | 25 | ..... | ..... | 12⅛ | 12 | ..... | ..... | ..... | ..... | 12¼ | 12 | 12 | .... | 1,213 |
| Wolverine | 25 | ..... | ..... | 108 | ..... | ..... | ..... | ..... | ..... | 109 | 108 | 108 | .... | 268 |
| Wyandot | 25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1¼ | .... | .1¼ | .... | 140 |

*Holiday. Total sales, 134,227 shares.

# STOCK QUOTATIONS.

## London (By Cable*).

| Company. | Apr. 25 £ | s. | d. | Company. | Apr. 25 £ | s. | d. |
|---|---|---|---|---|---|---|---|
| Camp Bird | 1 | 14 | 3 | Esperanza | 1 | 3 | 0 |
| Con. Gold Fields | 7 | 17 | 6 | Modderfontein | 10 | 13 | 9 |
| De Beers | 17 | 10 | 0 | Rand Mines | 10 | 16 | 3 |
| Dolores | 1 | 9 | 0 | Rio Tinto | 61 | 10 | 0 |
| East Rand | 8 | 7 | 6 | Simmer & Jack | 2 | 0 | 7½ |
| El Oro | 1 | 0 | 7½ | Tomboy | 1 | 0 | 0 |

* Furnished by Wm. P. Bonbright & Co., 24 Broad St., New York.

## Coal, Iron and Industrial Shares.

| Company. | Par Val. | Apr. 19 H. | Apr. 19 L. | Apr. 20 H. | Apr. 20 L. | *Apr. 21 H. | *Apr. 21 L. | *Apr. 22 H. | *Apr. 22 L. | Apr. 24 H. | Apr. 24 L. | Apr. 25 H. | Apr. 25 L. | Sales. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Allis-Chalmers | $100 | 16⅛ | 16⅛ | 16¼ | 16¼ | .... | .... | .... | .... | 16 | .... | 15¼ | .... | 1,300 |
| Preferred | 100 | 60¼ | .... | .... | .... | .... | .... | .... | .... | 60¼ | 59⅜ | .... | .... | 1,000 |
| Am. Agri. Chem. | 100 | 28 | 27½ | 27½ | 26 | .... | .... | .... | .... | 26½ | 26⅜ | 26½ | 26 | 2,540 |
| Preferred | 100 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Am. Sm. & Ref. | 100 | 119½ | 118½ | 119 | 115½ | .... | .... | .... | .... | 117 | 113½ | 119½ | 114⅜ | 297,095 |
| Preferred | 100 | 123¼ | 123½ | 123⅛ | 121½ | .... | .... | .... | .... | 123 | 122 | 122⅝ | 122 | 5,650 |
| Cambria Iron | 50 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Cambria Steel | 50 | 27 | .... | 27 | 26⅜ | .... | .... | .... | .... | 26½ | 26½ | 27 | 26½ | 3,269 |
| Col. Fuel & Iron | 100 | 57 | 54⅞ | 56½ | 52½ | .... | .... | .... | .... | 53½ | 49⅛ | 53⅛ | 51 | 105,887 |
| Preferred | 100 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Col. & H. C. & I. | 100 | .... | .... | 16½ | 16½ | .... | .... | .... | .... | 16 | .... | 16⅜ | 16 | 1,100 |
| General Chem. | 100 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Preferred | 100 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Lehigh Nav. | 50 | 107½ | .... | 107 | 104 | .... | .... | .... | .... | 105½ | .... | 107¼ | 106 | 1,635 |
| Mong. R. Coal | 100 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Preferred | 100 | .... | .... | 28½ | 27½ | .... | .... | .... | .... | .... | .... | .... | .... | 200 |
| National Lead | 100 | 49⅛ | 47 | 49⅜ | 47½ | .... | .... | .... | .... | 48½ | 44½ | 47½ | 43½ | 57,000 |
| Preferred | 100 | 107 | .... | .... | .... | .... | .... | .... | .... | .... | .... | 106 | 105¼ | 534 |
| Phila. Nat. Gas | 50 | 47 | 46⅛ | 46⅞ | 46⅛ | .... | .... | .... | .... | 46½ | 46⅜ | 46¼ | .... | 2,484 |
| Preferred | 50 | 49 | .... | 49 | .... | .... | .... | .... | .... | 49 | .... | 49 | 48½ | 257 |
| Pittsburg Coal | 100 | 18 | 17⅞ | 17⅝ | 17¼ | .... | .... | .... | .... | 17¾ | .... | 18 | 17⅜ | 1,215 |
| Preferred | 100 | 76 | 75½ | 74¼ | .... | .... | .... | .... | .... | 74¼ | 71⅜ | 74 | 73¼ | 4,625 |
| Republic I. & S. | 100 | 22¼ | 21½ | 21½ | 20 | .... | .... | .... | .... | 20⅜ | 19 | 21 | 20⅜ | 23,650 |
| Preferred | 100 | 80⅛ | 78¼ | 80 | 78 | .... | .... | .... | .... | 78½ | 76¾ | 78½ | 77¼ | 17,425 |
| Sloss: Shef. S. & I. | 100 | 92 | 91 | 91 | 89 | .... | .... | .... | .... | 89 | 87 | 89 | 88 | 2,300 |
| Preferred | 100 | .... | .... | 115 | .... | .... | .... | .... | .... | .... | .... | 115 | .... | 500 |
| Standard Oil | 100 | 635 | .... | 630½ | 630 | .... | .... | .... | .... | 628 | 625 | 625 | .... | 190 |
| Tenn. C. I. & R. R. | 100 | 102 | 98¾ | 100½ | 97 | .... | .... | .... | .... | 98 | 94⅜ | 97½ | 94 | 50,700 |
| U. S. Steel | 100 | 37⅛ | 36½ | 37⅜ | 35⅛ | .... | .... | .... | .... | 36½ | 34½ | 36½ | 35½ | 387,913 |
| Preferred | 100 | 104½ | 102½ | 103⅜ | 101½ | .... | .... | .... | .... | 102½ | 100½ | 102¼ | 101⅜ | 396,860 |
| Va. Car. Chem. | 100 | 37½ | 36½ | 37⅜ | 36 | .... | .... | .... | .... | 36½ | 35½ | 36 | 35½ | 13,360 |
| Preferred | 100 | 108½ | 107½ | 108 | .... | .... | .... | .... | .... | 107½ | 107 | 107½ | 107 | 989 |

*Holiday Total sales, 1,379,678.

## Mexico.

April 14

| Company. | Shares Issued. | Prices, Mex. Bid. | Prices, Mex. Ask. | Company. | Shares Issued. | Prices, Mex. Bid. | Prices, Mex. Ask. |
|---|---|---|---|---|---|---|---|
| DURANGO: | | | | San Rafael y An., aviada | 1,200 | $635 | $680 |
| Penoles | 2,500 | $2,600 | $3,000 | Soledad, aviada | 670 | 930 | 975 |
| San Andres de la Sierra | 200 | 10,000 | ..... | Sorpresa, aviada | 960 | 240 | 275 |
| GUANAJUATO: | | | | MEXICO: | | | |
| Cinco Senores y An., aviadoras | 2,000 | .11 | .15 | Aldebarren | 2,000 | 35 | 40 |
| Cinco, Senores y An., aviada | 400 | 32 | 40 | Buen Despacho | 3,000 | 42 | 50 |
| Providencia, San Juan de la Luz | 6,000 | 130 | 136 | Dos Estrellas | 3,000 | 3,600 | 3,650 |
| GUERRERO: | | | | La Esperanza (El Oro) | 3,000 | 1,500 | 1,500 |
| Garduno y Anexas | 7,200 | 31 | 35 | Santa Ana, Esperanza | 2,400 | 30 | 60 |
| HIDALGO: | | | | NUEVO LEON: | | | |
| Amistad y Concordia | 9,600 | .68 | .70 | La Fraternal | 1,000 | 580 | 620 |
| Carmen aviada | 1,100 | 150 | 175 | Norias de Bajan | 1,000 | 700 | 750 |
| Guadalupe Fresnillo Mill | 1,000 | 170 | 200 | SAN LUIS POTOSI: | | | |
| Guadalupe Fresnillo Mine | 1,400 | 70 | 100 | Concepcion y An | 3,000 | 20 | 30 |
| Maravillas y An., aviador | 1,680 | 70 | 100 | El Barreno, aviadora | 2,000 | 104 | 108 |
| Maravillas el Lobo | 1,000 | 130 | 180 | Sta. Maria de la Paz | 9,600 | 262 | 265 |
| Refugia, aviada | 12,800 | 5 | 7 | ZACATECAS: | | | |
| Sta. Gertrudis y An., aviadas | 9,600 | 8 | 12 | Asturiana y An | 2,500 | 8 | 12 |
| Sta. Gertrudis y An., aviadora | 28,800 | 67½ | 72 | Candelaria y Pinos | 2,500 | 55 | 75 |
| San Rafael y An., Trompillo | 1,200 | 1,900 | 1,950 | San Carlos y Annexas | 2,500 | 15 | 20 |
| | | | | Sta. Maria de Gaud | 2,500 | 86 | 93 |
| | | | | MISCELLANEOUS: | | | |
| | | | | Bartolome de Medina | 2,000 | 75 | 83 |
| | | | | Naica (Chihuahua) | 100 | 11,000 | 13,000 |
| | | | | Natividad (Oaxaca) aviadora | 1,800 | 600 | 700 |
| | | | | San Francisco Hac | 6,000 | 64 | 70 |
| | | | | Union Hacienda | 3,000 | 280 | 315 |

## Paris.

April 6.

| Company. | Location. | Par value. | Latest dividend. | Prices. Opening. | Prices. Closing. |
|---|---|---|---|---|---|
| | | Fr. | Fr. | Fr. | Fr. |
| Acieries de Creusot | France | 2,000 | 75.00 | 1,960.00 | 1,955.00 |
| Anzin, Coal | France | .... | 290.00 | 5,845.00 | 5,900.00 |
| Biache-St. Vaast | France | 1,000 | 160.00 | 3,605.00 | 3,605.00 |
| Boleo, c | Lower California | 500 | 104.17 | 2,728.00 | 2,630.00 |
| Bruay, Coal | France | 400 | 27.50 | 750.00 | 752.00 |
| Courrieres, Coal | France | 500 | 110.00 | 2,985.00 | 2,980.00 |
| Escombrera-Bleyberg, z.l. | France | 350 | 35.00 | 703.00 | 709.00 |
| Huanchaca, s | Bolivia | 125 | 2.50 | 89.75 | 85.00 |
| Laurium, z. l | Greece | 500 | 25.00 | 325.00 | 320.00 |
| Malfidano, z | Italy | 500 | 50.00 | 649.00 | 675.00 |
| Metaux, Cie. Fran. de | France | 500 | 22.50 | 545.00 | 549.00 |
| Mokta-el-Hadid. i. l | Algeria | 500 | 40.00 | 1,120.00 | 1,150.00 |
| Nickel, n | N. Caledonia | 250 | 22.50 | 700.00 | 725.00 |
| Penarroya, Coal | Spain | 500 | 45.00 | 1,180.00 | 1,185.00 |
| Vielle Montagne, z | Belgium | 30 | 30.00 | 832.00 | 840.00 |

## London.

April 14.

| Company. | Par Val. | Latest dividend. Amt. | Latest dividend. Date. | Quotations. Buyers. | Quotations. Sellers. |
|---|---|---|---|---|---|
| American: | £ s. | s. d. | | £ s. d. | £ s. d. |
| Alaska Treadwell | 5 0 | 6 0 | Feb., 1905 | 7 5 0 | 7 7 6 |
| Anaconda | 5 0 | 2 0 | Nov., 1904 | 6 11 3 | 6 13 9 |
| Camp Bird | 1 0 | 9 | May, 1905 | 1 12 6 | 1 13 9 |
| Copiapo | 2 0 | 5 0 | Oct., 1904 | 1 8 9 | 1 11 3 |
| De Lamar | 1 0 | 2 0 | Nov., 1904 | 17 6 | 1 0 0 |
| El Oro | 1 0 | 9 | July, 1904 | 1 0 0 | 1 2 6 |
| Frontino & Bolivia | 1 0 | rts. | Mar., 1904 | 17 6 | 18 6 |
| Le Roi | 5 0 | 5 0 | Nov., 1899 | 16 3 | 18 9 |
| Le Roi No. 2 | 5 0 | 2 0 | Jan., 1905 | 17 6 | 1 0 0 |
| Montana | 1 0 | 6 | Apr., 1899 | 9 | 1 3 |
| Stratton's Indep'd. | 1 0 | 6 | Feb., 1905 | 9 3 | 9 9 |
| St. John del Rey | 1 0 | 6 | Dec., 1904 | 12 6 | 13 6 |
| Tomboy | 1 0 | 1 0 | Dec., 1904 | 1 2 6 | 1 5 0 |
| Tyee | 1 0 | 2 0 | Dec., 1904 | 1 7 9 | 1 10 0 |
| Utah Con | 1 0 | 6 0 | Jan., 1905 | 8 15 0 | 9 0 0 |
| Ymir | 1 0 | 1 0 | Mar., 1902 | 1 3 | 3 9 |
| European: | | | | | |
| Libiola | 5 0 | 1 6 | May, 1904 | 1 12 6 | 1 15 0 |
| *Linares | 3 0 | 5 0 | Apr., 1905 | 4 0 0 | 4 10 0 |
| Mason & Barry | 1 0 | 7 0 | May, 1905 | 8 0 0 | 3 5 0 |
| Rio Tinto | 5 0 | 37 6 | Apr., 1905 | 63 5 0 | 63 10 0 |
| Rio Tinto, pf. | 5 0 | 2 6 | Apr., 1905 | 6 2 6 | 6 7 6 |
| Tharsis | 2 0 | 7 0 | May, 1905 | 5 2 6 | 5 7 6 |
| West Australian: | | | | | |
| Associated | 1 0 | 2 6 | July, 1904 | 2 0 0 | 2 1 3 |
| Cosmopolitan | 1 0 | 1 0 | Apr., 1904 | 7 0 | 7 6 |
| Golden Horseshoe | 5 0 | 6 0 | Apr., 1905 | 7 16 3 | 7 18 9 |
| Great Boulder | 2 | 9 | Apr., 1905 | 1 1 6 | 1 2 0 |
| Gt. Boulder Perse | 1 0 | 9 | Mar., 1905 | 12 9 | 13 3 |
| Great Fingall | 1 0 | 7 6 | Apr., 1905 | 8 2 6 | 8 5 0 |
| Ivanhoe | 5 0 | 9 0 | Apr., 1905 | 8 5 0 | 8 7 6 |
| *Kalgurli | 1 0 | 2 6 | Apr., 1905 | 7 5 0 | 7 7 6 |
| Lake View | 1 0 | 1 6 | Oct., 1904 | 18 9 | 1 1 3 |
| Oroya-Brownhill | 1 0 | 4 0 | Mar., 1905 | 3 5 3 | 3 6 5 |
| Miscellaneous: | | | | | |
| Brilliant Central | 1 0 | 6 | Apr., 1905 | 12 6 | 15 6 |
| Brilliant & St. Geo | 10 | 6 | Apr., 1905 | 16 0 | 17 0 |
| Briseis Tin | 1 0 | .... | .... | 13 0 | 13 6 |
| Broken Hill | 8 | 1 6 | Feb., 1905 | 2 2 6 | 2 3 9 |
| Mt. Lyell | 3 0 | 1 3 | Dec., 1904 | 19 6 | 1 0 6 |
| Mt. Morgan | 1 0 | 3 | Apr., 1905 | 2 17 6 | 3 0 0 |
| Waihi | 1 0 | 2 6 | Mar., 1905 | 6 15 0 | 6 17 6 |
| Indian: | | | | | |
| Champion Reef | 10 | 1 3 | Apr., 1905 | 1 15 0 | 1 16 0 |
| Mysore | 10 | 5 6 | Mar., 1905 | 6 15 0 | 6 17 6 |
| Nundydroog | 10 | 1 6 | Mar., 1905 | 1 10 0 | 1 11 3 |
| Ooregum | 10 | 9 | Apr., 1905 | 18 6 | 19 6 |
| Ooregum, pf | 10 | 9 | Apr., 1905 | 1 7 0 | 1 9 0 |
| South African: | | | | | |
| Angelo | 1 0 | 5 0 | Feb., 1905 | 6 10 0 | 6 12 6 |
| Bonanza | 1 0 | 7 0 | Feb., 1905 | 18 9 | 1 1 3 |
| British So. Africa | 1 0 | rts. | May, 1899 | 1 18 1 | 2 0 7 |
| Cape Copper | 2 0 | 6 | Jan., 1905 | 4 2 6 | 4 5 0 |
| Cape Copper, pf | 2 0 | 6 | Jan., 1905 | 3 17 6 | 4 2 6 |
| City & Suburban | 4 0 | 6 0 | Feb. 1905 | 5 12 6 | 5 17 6 |
| Consol. Gold-F'lds. | 1 0 | 2 6 | Dec., 1904 | 7 17 6 | 8 0 0 |
| Crown Reef | 1 0 | 1 0 | Apr., 1905 | 14 10 0 | 15 0 0 |
| De Beers, preferred | 2 10 | 10 0 | Feb., 1905 | 18 3 9 | 18 6 3 |
| De Beers, deferred | 2 10 | 2 0 | Feb., 1905 | 17 13 9 | 17 16 3 |
| East Rand | 1 0 | 4 0 | Feb. 1905 | 8 8 9 | 8 11 3 |
| Ferreira | 1 0 | 2 0 | May, 1905 | 19 0 0 | 20 0 0 |
| Geldenhuis | 1 0 | 5 0 | Feb., 1905 | 4 15 0 | 5 0 0 |
| Geduld | 1 0 | rts. | Mar., 1902 | 7 8 9 | 7 11 3 |
| Henry Nourse | 1 0 | 8 0 | Feb., 1905 | 7 12 6 | 7 17 6 |
| Heriot | 1 0 | 5 0 | Sept., 1899 | 4 2 6 | 4 7 6 |
| Jubilee | 1 0 | 5 0 | May, 1905 | 3 7 6 | 3 12 6 |
| Jumpers | 1 0 | 2 6 | May, 1904 | 1 17 6 | 2 2 6 |
| Knights | 1 0 | .... | .... | 5 12 6 | 5 15 0 |
| Langlaagte | 1 0 | 2 0 | Feb., 1905 | 3 11 3 | 3 13 9 |
| May | 1 0 | 4 0 | Feb., 1905 | 3 16 3 | 3 18 9 |
| Meyer & Charlton | 1 0 | 5 0 | Feb., 1905 | 5 0 0 | 5 5 0 |
| Modderfontein | 1 0 | rts. | Apr., 1902 | 10 11 3 | 10 13 9 |
| Namaqua | 2 0 | 3 0 | Dec., 1904 | 3 13 9 | 3 16 3 |
| New Goch | 1 0 | .... | .... | 2 13 9 | 2 16 3 |
| New Kleinfontein | 1 0 | rts. | Apr., 1902 | 2 5 0 | 2 7 6 |
| New Primrose | 1 0 | 3 0 | Feb., 1905 | 2 18 9 | 3 1 3 |
| Premier, def | 2½ | 10 0 | May, 1905 | 16 0 0 | 16 5 0 |
| Premier, pf | 5 | 6 3 | May, 1905 | 9 3 9 | 9 6 3 |
| Rand | 5 | 5 0 | Aug., 1904 | 10 13 9 | 10 16 3 |
| Randfontein | 1 0 | rts. | Apr., 1899 | 2 17 6 | 2 18 9 |
| Robinson | 5 0 | 8 0 | Feb., 1905 | 9 7 6 | 9 12 6 |
| Robinson Deep | 1 0 | 3 0 | Aug., 1904 | 6 3 9 | 6 6 3 |
| Rose Deep | 1 0 | 3 0 | Feb., 1905 | 8 0 0 | 8 5 0 |
| Salisbury | 1 0 | 2 0 | May, 1905 | 1 10 0 | 1 15 0 |
| Sheba (fully paid) | 1 0 | rts. | Feb., 1904 | 9 3 | 9 9 |
| Simmerf & Jack | 1 0 | 6 | May, 1905 | 2 0 0 | 2 1 3 |
| Village Main Reef | 1 0 | 4 0 | Jan., 1905 | 5 17 6 | 6 2 6 |
| Wemmer | 1 0 | 12 6 | Dec., 1904 | 7 0 0 | 7 10 0 |

*Ex-dividend.

## Ishpeming, Mich.*

Week, April 22.

| COMPANY. | Par Val. | High. | Low. | Last Sale. |
|---|---|---|---|---|
| American Dev | $15 | $86.00 | $86.00 | $86.00 |
| Black Mountain ($3 paid) | 5 | 3.05 | 3.00 | 3.05 |
| Black Mountain (Full paid) | 5 | 4.75 | 4.75 | 4.75 |
| Calumet & Arizona | 10 | 106.00 | 105.00 | 105.50 |
| Calumet & Pittsburg | 10 | 35.00 | 34.00 | 33.50 |
| Junction Dev. ($11 paid) | 15 | 88.00 | 87.00 | 88.00 |
| Lake Superior & Pittsburg | 10 | 42.00 | 41.00 | 41.00 |
| Manhattan | .... | 10.00 | 9.50 | 10.00 |
| North Butte ($10 paid) | 15 | 25.00 | 22.87½ | 23.00 |
| Pittsburg & Duluth (Full paid) | 15 | 25.00 | 23.50 | 23.25 |
| Wolv. & Ariz | 15 | 3.50 | 3.00 | 3.25 |

* By The Wallace H. Hopkins Co.

## Questions and Answers.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others beside the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

*Gold Production of the World.*—Can you tell me what was the total gold production of the world up to the end of 1904? Also, the total production of the United States to the same date?—G. T.

*Answer.*—It is only in recent years that figures of gold production, with any approach to exactness, have been attainable. Researches into this subject have generally been confined to the period since 1493, when the discovery of America gave a great impetus to the production. The estimates for the 390 years from that date to 1883 are based upon such coinage reports, commercial reports and other statistics as are available. Previous to 1493 there are absolutely no available sources of information, and we are reduced entirely to conjecture. With this preface, we may say that, up to the end of 1904, the production of gold in the world since 1493 has been 344,415,941 fine ounces. The figures from 1493 to 1883 are those given by Soetbeer, probably the best authority on the subject. From 1882 to 1892 the figures are those given by the Director of the United States Mint; from 1892 to 1904 those collected for 'The Mineral Industry.' The production of gold in the United States since 1792 has been 132,290,984 fine ounces. The figures from 1792 to 1873 are those collected by R. W. Raymond; from 1873 to date the figures are those given by the Director of the Mint.

*Manjak.*—Can you tell what the mineral called manjak is, and where it is found?—C. F.

*Answer.*—The following statement is taken from Merrill's 'Non-Metallic Minerals,' page 366: "The local name of manjak is applied to a variety of bitumen somewhat resembling uintaite, occurring on the island of Barbadoes, in the West Indies. The material is a very pure hydrocarbon of a black color, but yielding a brown powder, high luster, and with a bright conchoidal fracture. It is brittle, and so friable that it can be ground to powder between the thumb and fingers. It occurs in seams or veins, varying from 0.25 in. to 30 ft. in thickness, cutting the country rock, which is an argillite or shale, at all angles with the horizon and with a general NNE strike. In places the bituminous matter has saturated the entire rock in the neighborhood of the veins, producing a shale from which as much as 37 gal. a ton of petroleum have been obtained by destructive distillation. Thus far the greatest development is along a vein 200 ft. in length, 100 ft. in depth, and from 3 to 9 ft. in width. One vein, which has been explored to a depth of 200 ft., is stated to have dwindled down to a width of 6 ft., though 30 ft. wide at the surface.

"Like gilsonite, the material is used for making varnishes, insulating electric wires, etc., bringing the price of this mineral from $5 to $10 a ton, according to quality and freedom from impurities."

## Recent Legal Decisions.

SPECIALLY REPORTED.

WATER RIGHTS ON PLACERS IN BRITISH COLUMBIA.—The County Court has jurisdiction over water rights appurtenant to placer claims. Though such jurisdiction is concurrent with that of the Supreme Court, it is not ousted by the mere fact that an action was begun in the Supreme Court by the same parties, respecting the same subject matter before it was begun in the County Court, and if no objection is taken it will continue to exercise its jurisdiction. If objection is taken, the proper course is to apply to stay one of the actions, and it depends upon the circumstances which one will be stayed. It is too late to object to the jurisdiction after judgment. A layman is a leaseholder and may apply for a water record, which is appurtenant to the mine and not to the miner. No one has a status to attack a water record who has not got one himself, or what is equivalent to one under the act; a right to water under Sec. 29 confers such a status. Individual miners working on the same creek who have statutory rights in the same water may join in an application for a record, or to reduce or modify an existing record, which is being misused to their disadvantage, and on such application the Gold Commissioner may take such adjudication as seems to him just; and unless those interested who participated in, or properly had notice of, the proceedings appeal from his decision, in the summary way provided by Sec. 36, they are bound by it. If the action taken by the Gold Commissioner was the proper one, it is not invalidated because he gave wrong reasons, or relied on one section instead of another which authorized his action.—Brown and others *vs.* Spruce Creek Power Company, Ltd. (Martin's 'Mining Cases,' Vol. II, Part I); Supreme Court of British Columbia.

The tunnel of Gravehals, near Voss, Norway, is 5,300 m., or about three miles, in length. It was begun in 1896 and was finished in 1902; but the termini have been finished only recently. The tunnel is on the Christiania-Bergen line, in the southwestern part of the peninsula. The tunnel would attract much more attention were it not surpassed in length and commercial importance by other long subterranean ways elsewhere.

## Abstracts of Official Reports.

*Rio Tinto Company, Ltd.*

This company owns the ancient and famous mines of Rio Tinto, in Spain, together with railroads, shipping ports and other auxiliary works. It is the largest and most important copper mining company outside of the United States. The mines, chiefly open-cut workings, are in an immense deposit of copper-bearing pyrite. The report is for the year ending Dec. 31, 1904.

The capital liabilities include £1,625,000 in 5% preference shares, £1,625,000 in ordinary shares, and £3,027,900 in 4% first-mortgage bonds. The shares are all of £5 par value. The income account, as stated in sterling from the London office, may be condensed as follows:

| | |
|---|---|
| Profit on products for 1904 | £1,666,531 |
| Rents, interest, etc. | 46,977 |
| Total | £1,714,508 |
| Taxes in Spain, income tax, etc | £163,933 |
| General expenses in Spain | 47,176 |
| London expenses and directors' fees | 30,606 |
| Depreciation | 49,559 |
| Provident fund | 2,500 |
| Interest on bonds, etc | 124,581 |
| Redemption of mortgage bonds | 74,080 |
| Total charges | £492,445 |
| Balance, surplus for the year | £1,222,063 |
| Balance forward from 1903 | 20,189 |
| Total sur plus | £1,242,25 |

From this surplus dividends amounting to £77,272, or 5%, were paid on the preference shares. One interim dividend of 32s. 6d. per share was paid in November, on the ordinary stock, and one of 37s. 6d. has been declared. These dividends will require £1,137,500, making a total on all shares of £1,214,772, and leaving a balance of £27,480 forward to current year. The total dividend on the ordinary stock was 70s. per share, or 70% for the year.

The production of pyrite from the mine was as follows, in long tons:

| | 1903. | 1904. | Changes. |
|---|---|---|---|
| For shipment | 688,919 | 672,344 | D. 16,575 |
| For local treatment | 1,229,619 | 1,276,475 | I. 46,856 |
| Total | 1,918,538 | 1,948,819 | I. 30,281 |
| Average % copper | 2.39 | 2.34 | D. 0.05 |

The report says: "By the usual fixed charge on pyrites, the balance of extension and development account was reduced by £13,159, and now stands at £71,508. On the North Lode opencast, the overburden removed during the year amounted to 199,009 cubic meters, the entire cost of which has, as usual, been charged to revenue. The balance of the old account, £3,253, was extinguished during the year by a charge on pyrites. On the Lago opencast, 322,785 cubic meters of overburden were removed during the year. The reduction of the overburden account, in accordance with the policy indicated in last year's report, has commenced, as mineral extraction has now begun, and £6,747 been written off. On the Dehesa opencast, 460,000 cubic meters of overburden were removed during 1904, and it is hoped in little more than a year hence the mineral

will be reached. On the South Lode opencast, 614,000 cubic meters of overburden were removed and the cost of removal was all charged to revenue.

"The quantity of pyrites invoiced to consumers was 663,744 tons against 667,748 tons in 1903, and 595,092 in 1902. Of the year's deliveries, Germany took 275,530 tons, and the United Kingdom 243,374 tons, while to America the shipments have been 144,840 tons. The sulphur ore delivered in 1904 was 157,810 tons, against 118,174 tons in 1903. In order to further encourage the consumption of this class of ore, the company has interested itself, to a moderate extent, in the manufacture of superphosphate manures in Spain. The copper produced during the year by treatment at the mines was 21,218 tons; the copper in pyrites shipped amounted to 12,260 tons; making a total of 33,478 tons. The following quantities were brought to market: Refined copper, 23,010 tons; copper in sulphate, 1,575 tons; copper in pyrites, 11,394 tons; total, 35,979 tons. The Rio Tinto make is sold as refined copper, or on the basis of the current price of refined. The average market price of best selected refined over the whole of 1904 was 2s. 6d. per ton under the average of 1903. Standard copper averaged only £57 13s. 2d. per ton for the first 10 months of the year, as against £58 3s. 1d. for the whole of 1903. During November and December, however, the copper market considerably improved, and this improvement has since been maintained. The general demand for consumption is good and public stocks are still low.

"The smelting and refining plants gave excellent results. Their operations have been extended, and further improvements and additions are contemplated. More copper was recovered during the year from the old Cwmavon furnace bottoms than was anticipated. The books indicate that the reserve heaps now contain 152,190 tons of copper, and they yield by washing a good deal of copper each year. For the past year a slight reduction was made in the book cost of this copper, which now stands at £4 5s. 6d. per ton of copper. All other copper in process of manufacture was carried forward at cost price. The railway and shipping prices were maintained at the cost of revenue, and are in good working order. The public railway traffic returns are again quite satisfactory."

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*Isle Royale Copper Company.*

The report of this Keweenaw company covers the year 1904. Exploration has been directed to the upper part of the Grand Portage lode, which had never been developed above the ninth level, and to the extension of the Isle Royale lode in Section 11, a railroad having been built to the latter opening as soon as the value of extensive operations was assured. Drifts on the various levels off the main or No. 2 shaft have been extended 2,315 feet.

Operations during the last two years compare as follows:

| | 1903. | 1904. |
|---|---|---|
| Rock hoisted | 232,851 | 178,046 |
| Tons rock stamped | 199,493 | 154,330 |
| Pounds mineral obtained | 4,408,615 | 3,343,010 |
| Percentage refined copper in mineral | 71.102 | 73.075 |
| Pounds refined copper per ton of rock stamped | 15.7 | 15.8 |
| Product fine copper | 3,134,601 lb. | 2,442,905 lb. |
| Cost per pound at mine, excluding construction | 9.81c. | 9.62c. |
| Cost per pound for construction | 0.00c. | 0.20c. |
| Cost per pound exploration, railway, etc. | 0.23c. | 1.28c. |
| Cost per pound of smelting, freights, eastern expenses, commissions, and all other charges | 1.81c. | 2.20c. |
| Cost per pound of refined copper | 11.85c. | 13.30c. |
| Cost of mining and stamping per ton of rock stamped | $1.54 | $1.52 |
| Cost of stamping per ton | 28.84c. | 30.51c. |
| Average number of men employed | 302 | 242 |

Early in the year a careful estimate was made as to the cost of replacing the timber that had been burned in No. 1 shaft. This appeared to be greater than was warranted by the showing that had been made in mining the ground tributary to this shaft, and it was decided that the money could be used to better advantage in opening up new ground in the vast tract of unexplored territory owned by the company which had never been systematically explored, which exploration could be expected to disclose values as good as had been found in the ground opened by No. 1 shaft. The Grand Portage lode, which lies west of and 150 ft. distant from the Isle Royale lode, had been worked upon at several points, and had produced a considerable quantity of good rock, which was hoisted through No. 1 shaft. This lode had been opened by means of seven cross-cuts, driven from the openings on the Isle Royale lode at the 9th, 10th, 11th, 12th, 13th, 14th and 15th levels. Nothing had been done above the 9th level, however, and it was reasonable to assume that the large unexplored block of ground above the 9th level, and extending from the old Grand Portage workings on the north, a distance of 3,000 ft. or more, to a point near No. 2 shaft, would contain shoots of productive ground which could be explored cheaply from the surface by means of pits, or by a drift from the Grand Portage mine, which would follow the lode at a shallow depth, and from which openings could be made to the surface at intervals. The latter plan was decided upon, and a drift was started from a point about 100 ft. below the surface, in an old shaft of the Grand Portage mine. At the close of the year this drift had progressed 381 ft. It has gone through stretches of copper-bearing lode, one of which was continuous for a distance of 100 ft., and of sufficiently high grade to appear worthy of further efforts. Work was suspended when the severe winter weather set in, but will be resumed when the weather moderates.

Early in the summer, work was begun at the point in Section 11 where the extension of the Isle Royale lode had been located by means of the diamond drill, as mentioned in the last report. A large pit was sunk to the outcrop, and, having found it to be heavily charged with copper, a shaft was started in the lode.

The requisite machinery was quickly installed and sinking was continued to 129 ft., where a station was cut and drifting in both directions was begun. The appearance of the lode justified preparations for extensive working, especially as ample mill facilities were available, so that the construction of a railroad extension from the mine to the new shaft was begun at once and was completed by the end of the year. The track is laid with 70-lb. rails, and is 8,900 ft. long.

By the time the railroad was finished, a small shaft house with engine and one rock-breaker had been erected for the direct crushing and loading of ore. Rock that had been taken out previously had been stacked near the shaft. To avoid an excessive amount of this material, which would have to be rehandled, the exploratory workings were limited in size to that of ordinary drifts, and were enlarged to the dimensions of drift stopes only a few days before the completion of the railroad.

At the end of the year the drift stope north from the shaft had gone 32 ft., and the one south had been driven 183 ft. All of the ground opened, both in the shaft and drifts, has been of such a grade as to indicate that an extensive, high-grade shoot of copper-bearing ground exists which should develop into an extensive mine. This opinion is strengthened by the evidence obtained from the diamond drilling, which pierced the lode at a point 400 ft. below the surface.

In addition to this work, exploring by means of pits and trenches was done on the northeast quarter of the southeast quarter of Section 11, for the purpose of locating the "Baltic" lode, which, if it maintains its regular course, should be found on this portion of the property. No satisfactory results were obtained, although geological data were collected which will be a valuable guide to future explorations.

The diamond drill was set up in October near the south boundary of the property in Section 15, for the purpose of locating the extension of the Isle Royale lode at that point. The identity of the various beds penetrated up to date is not determined, and cannot be until one of the known beds of conglomerate is reached.

The openings in the main part of the mine during the year have developed ground of average grade. No. 2 shaft was sunk 54 ft., and drifting at the 17th level north and south has been done, amounting to 215 ft. This level will open ground sufficient to maintain the reserve, and, so far as extended, shows ground of average richness. Shipments to the mill from No. 2 shaft for the year have averaged 12,900 tons per month. This amount has been sufficient to keep one head of

stamps in operation practically all the time. The cost of handling a ton of rock, on such a small scale, has been as reasonable as could be expected, and compares favorably with what has been done in former years.

At the mill, preparations are completed to convert one stamp into a "tandem compound" head. The value of this arrangement has been proved in other mills. In addition to the change in the stamp, a set of rolls has been installed to re-crush the oversize from the rotating screens, instead of elevating this material back to the stamp for recrushing. This arrangement increases the capacity of the mill at a small cost for installation, and will tend further to reduce milling costs.

The company, organized in New Jersey, is capitalized at $3,750,000. The net profit for the year, after paying for the railroad extension and for the recent exploration out of the year's earnings, was $17,103, which, added to the balance on hand, gives $517,639 as a surplus at the end of the year.

## A Gasoline-driven Rock-drill.

The accompanying illustration shows a new pattern of rock-drill, which the makers call the "Bull Dog"; the special feature is that the drill is operated by a gasoline motor, which is self-contained. The engine is of the two-cycle, air-cooled type, with cylinder 4-in. bore by 4-in. stroke. This drill is built by the Gasoline Rock Drill Company, of Philadelphia, and is designed for use in mines and all other places where rock-drilling is carried on. The peculiar advantages claimed are that the drill, with the self-contained power, is light and easily carried; can be transported on the back of a mule or burro if required. When it is not in actual operation the working expenses cease, and it is not necessary to keep up steam or pressure of condensed air for the purpose of operating. It is also claimed that, in many places, the expense is reduced by the use of gasoline instead of other fuel.

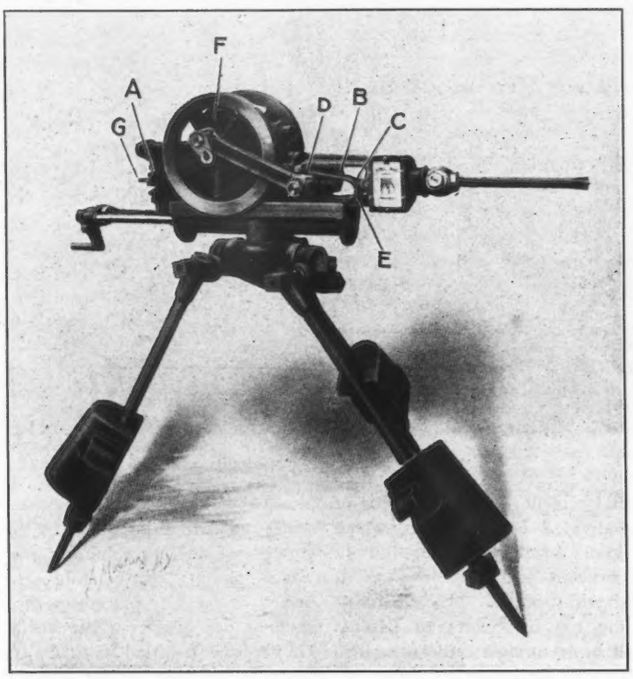
By cranking the flywheel in the ordinary manner the piston draws in a charge of gas mixture, compressing it in the front chamber, and at the proper point it is transferred to the rear chamber, where the compressed charge behind the piston is exploded by an electric spark. This explosion behind the piston drives the hammer *B* forward to strike the anvil *C*. The crosshead *D* is arranged with buffer behind the hammer, which buffer, together with the connection with the flywheels, by means of the connecting-rods, carries the piston over the center, returning it to receive the new charge. The arrangement of the piston proper, covering and uncovering the ports, renders the use of delicate movable valves unnecessary, reducing expense for repairs.

The ratchet fork *E* engages the crosshead at one end, and at the other end, by an arrangement of a pawl with its axis eccentric with the axis of the rotating ratchet-wheel in the ratchet-box, rotates the entire chuck and bit on the return of each blow of the bit in the rock. The arrangement of the hammer-blow against the anvil in the chuck, keeps the cutting bit constantly in contact with the rock, except on the return of the ram, when it is withdrawn and rotated. As the drill can be run without striking the rock, there need be no fitchered holes, as the drill can be gradually fed up to ream out the holes in case of a hard streak or seamy rock. The commutator *F* and the spark-plug *G* are connected by wires to the electric batteries in the power-box. By the depression of the commutator lever, the spark is advanced, and the drill speeded up. The spark-plug conveys the spark to the interior of the cylinder for the explosion of the charge. A carbureter has been especially designed for this drill.

The drill proper, including saddle, but exclusive of clamp, weighs 325 lb.; the length from end of chuck to end of feed crank is 4 ft. 2 in. The drill can be mounted on the standard bar, column, or tripod, and adjusted to any position to bore at any desired angle. The method of feeding the drill into the rock is that common to standard makes of rock-drills. The drill maintains a working speed of 1,500 blows per minute, and this gives high cutting power. In the hardest granite it has drilled 3 in. per minute, a safe average being 1½ in. In sandstone 6 in. per minute has been made.

As to power plant, the ordinary steam plants, engines, boilers, building foundations and compressor plants are replaced by a small power-box, weighing 75 lb., consisting of batteries, and spark coil for ignition purposes, and a copper gasoline tank containing one day's supply of gasoline—3 gal. per 8-hour shift.

In underground workings, the exhaust fumes are conveyed to the surface by means of common pipe or galvanized iron or sheet-metal tubing, as the exhaust gases are under but slight pressure. The diameter of this conduit increases as the distance advances from the drill. The drill is an excellent ventilator, as at every stroke of the piston there is drawn in 50 cu. in. of air, and at 1,500 strokes per minute it takes in 43 cu. ft. of air, which is carried to the surface and must be replaced by pure air from the outside.



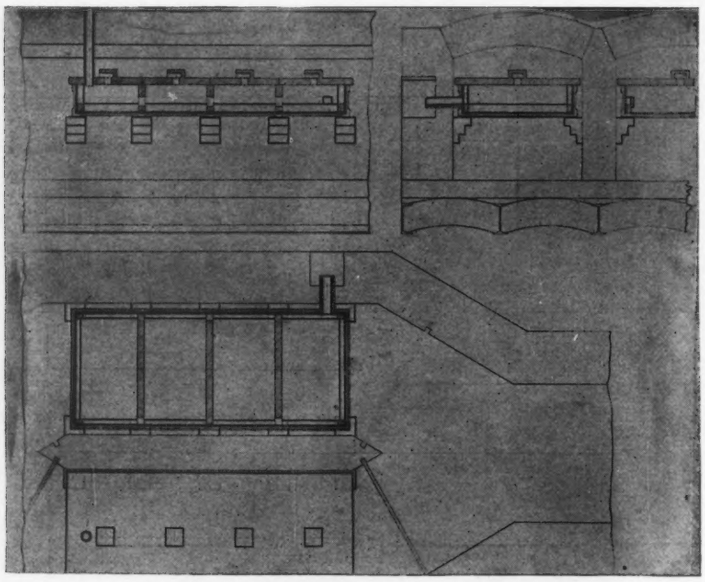

BULL-DOG DRILL ON TRIPOD.

ELECTROLYTIC TREATMENT OF CUPROUS SULPHIDE.—Messrs. Bodländer and Idaszewski describe in the current number of the *Zeitschrift für Elektrochemie* their investigations at the Brunswick Technische Hochschule with regard to the electrolytic extraction of copper from its sulphur compounds. Experiments in the electric furnace with a pure cuprous sulphide proved the melting point to be 1,091° C. They then tried to electrolize the molten sulphide, but without success, although the current had been passed through it for three hours. Subsequent experiments, however, showed that molten copper is soluble in the sulphide. It was also proved that it is not possible to separate copper by means of electrolysis from fused mixtures of sodium sulphide and cuprous sulphide. In the course of these experiments a new compound, NaCuS, in the form of minute steel-blue needles, was isolated.

## The Zanner Pans.

By W. R. Ingalls.

The Zanner pans (United States patent 693,635, Feb. 18, 1902), for the concentration of sulphuric acid or other corrosive liquors, are made of special cast iron, about 5/8 in. thick, lined on the inside with special, acid-resisting, stoneware tiling, ½ in. thick. The lining tiles are put in with a special cement, and the interior of the pan is divided by cross-tiles which cover the joints in the side and bottom lining and prevent acid from coming in contact with the joints. The pans are closed at the top by covers of similar tiling, which have suitable outlets for the escape of vapor, these outlets being so arranged as to prevent the ingress of dust, soot, etc. The pans are arranged to rest on ledges of brick set out from the sides of the flue, or furnace, and are provided with proper inlets for the weak acid and outlets for the strong acid. The pans are so set in the flue that nearly the entire width of the latter is occupied, so that the heating gases are forced to pass through the spaces above and below the pans. The cross partitions inside of the pans not only protect the joints of the lining, but by a suitable arrangement of apertures they cause the acid to pass through the pans in a zigzag, and therefore prolonged, way, the apertures for the passage of the acid being situated alternately at opposite sides of the pan.



ZANNER PAN—PLAN AND ELEVATION.

The Zanner pans are made in the following sizes:

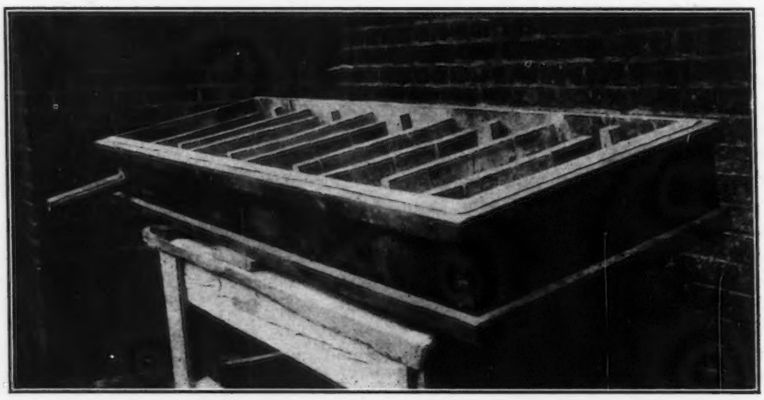
| | | | |
|---|---|---|---|
| Length | 80 in. | 80 in. | 80 in. |
| Width | 16 | 24 | 32 |
| Depth | 8 | 8 | 8 |

The pans are designed especially for installation in flues, wherein advantage can be taken of the waste heat of furnaces. They can, of course, be applied also for direct heating from a fireplace, such an installation having been made at the works of the United States Zinc & Chemical Company at Argentine, Kansas. In either case, the thermal efficiency of the pan is high, its position in the flue, or furnace, causing it to be subject to heating from all sides.

The Zanner pans are adapted to installations of various kinds, which will suggest themselves to engineers engaged in the concentration of sulphuric acid, or other corrosive liquors. In the Zanner process of making sulphuric acid (United States patent 768,108, Aug. 23, 1904), a series of pans is placed in the flue conducting the gas from the burners to the Glover tower. Acid to be concentrated is fed continuously to the first pan of the series, either from the Glover tower or from lead pans which can be set on the flues. The acid to be concentrated will in the latter case pass first into the lead pans, and from them will flow through a tube into the first of the series of Zanner pans. The acid entering the latter should be hot and previously concentrated as highly as possible. The acid passes through the Zanner pans in a zigzag direction, caused by the arrangement of the cross partitions, and finally flows out through a launder passing through the side wall of the flue, or furnace, as acid of 66° B., which is conducted to suitable cooling apparatus.

The quality of the acid produced depends upon the character of that which is supplied. With a supply of chamber acid it is possible to obtain acid of 66° B., of crystal limpidity, in no way inferior to acid concentrated in platinum. With a supply of Glover tower acid, the concentrate is in general of good limpidity, but sometimes possesses a yellowish shade. When the Zanner pans are placed in the flue leading from the burners to the Glover tower the acid vapor driven off passes on to the tower without loss. In the case of such installations it is important to arrange the flue with a by-pass, or else place two series of pans side by side, in order that either one of the series may be cut out for repairs, which are required after seven or eight months of operation, without disturbing the continuity of the process. This is, of course, unnecessary if the pans be run with direct heat from a fireplace.

In concentrating acid of 60° B., the output of acid of 66° B. is 300 to 500 lb. per sq. ft. of pan-bottom per 24 hours, the variation in results being due to differences in the strength and temperature of the acid entering the pans and the temperature of the gases in the flue wherein the pans are heated. With a temperature of 400 to 500° C. in the flue, and a feed into the pans of acid of 60° B. at a temperature of 150° C., the production of acid of 66° B. is about 400 lb. per sq. ft. of pan-bottom per 24 hours. A pan of 80 by 32 in., having an area of about 17.5 sq. ft., will therefore produce about 7,000 lb. of acid of 66° B. per 24 hours under the above conditions. As compared with ordinary concentration by direct firing, there is a saving of 200 to 400 lb. of coal per 2,000 lb. of acid of 66° B. produced, besides a saving in repairs and interest and amortization charges, the cost of installing the Zanner pans being much lower



THE ZANNER PAN.

than that for any other system of acid concentration.

In the concentration of sulphuric acid heretofore, besides the expensive stills made of platinum or platinum-gold alloy, apparatus made of lead, cast iron, glass and porcelain has been used, all of which are subject to rapid destruction. Cast-iron pans have the disadvantage that they require the acid charged to be already of a high degree of concentration (about 64° B.), and the vapor driven off in the concentration has a violently corrosive action on the iron above the level of the acid in the pan. Apparatus made of glass or porcelain is unable to withstand high temperatures, and especially changes in temperature, without danger of breakage. These drawbacks are obviated by the Zanner pans.

As compared with other systems of concentration, the Zanner pans save largely in first cost, interest on the investment, depreciation and repairs. As compared with platinum stills, they save in wear. As compared with iron pans, they also save in wear and prevent contamination of the acid by iron and loss of acid by combination with iron. When the Zanner pans are installed in the flues leading from the burners to the Glover tower they save largely in fuel, in labor and loss of acid in vapor. They make a similar saving in fuel and labor when installed to utilize waste heat from any source, as, for example, steam boilers or furnaces of many kinds.

The Zanner pans are useful not only for the concentration of sulphuric acid, but also for the evaporation of any corrosive chemical for which fragile and expensive vessels of platinum, porcelain or enameled ware have heretofore been required.

The Zanner pans are now in regular use at the works of the following companies: Société anonyme de Produits Chimiques de Laeken, Belgium; Kunheim & Company, Niederschöneweide, near Berlin, Germany; Vorster-Grüneberg, Kalk-bei-Koln, Germany; Lazy-hütte, Upper Silesia, Germany; United Zinc & Chemical Company, Argentine, Kansas.

The Mines & Metallurgical Company, of No. 11 Broadway, New York, is the agent for the Zanner pans and process in the United States.

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BARGES ON THE OHIO RIVER.—The Cleveland *Marine Review* says that in the transportation of finished iron and steel products, glassware, pottery, etc., to lower Ohio ports and to the South on the Ohio and Mississippi, model barges are utilized. Unlike the coal barges. their hulls are modeled along the lines of the hull of a steamer. Until recently they were entirely built of wood, but steel construction is already making headway. The majority of the models now in use are 225 ft. long and 36 ft. wide, and are usually loaded to a depth of 9 ft. Their carrying capacity varies from 900 to 1,500 tons. The Monongahela River Consolidated Coal & Coke Company, Pittsburg, owns 69 model barges, all of wood construction, and transports from 150 to 175 barge-loads a year from Pittsburg and lower Ohio ports to southern ports. Owing to the uncertainties of the barge-water stages under the present freshet system, and the consequent uncertainty of delivery of cargoes, this shipping is still in an undeveloped stage, but with an improved 9-ft. channel on the Ohio, this traffic would grow to tremendous proportions. The principal iron and steel products now shipped to the South from the mills in the Pittsburg district consist of rails, wire nails and wire products, cotton ties and hoops and bands.

A record in the transportation of coal was made last year by a tow of 56 coal-boats, taken down the Ohio from Pittsburg by the steamboat *Sprague*. These boats carried 53,000 tons of coal. This is possibly the largest quantity of coal ever carried by a single motor.

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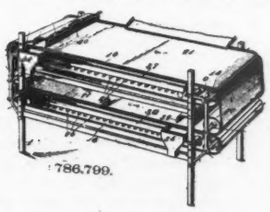
## Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

*Week Ending April* 11, 1905.

786,799. ORE-CONCENTRATOR. — Peter H. Craven, Rossland, Canada. An ore-concentrator comprising a plurality of slatted belts, and a single concentrating-belt traveling with and


786,799.

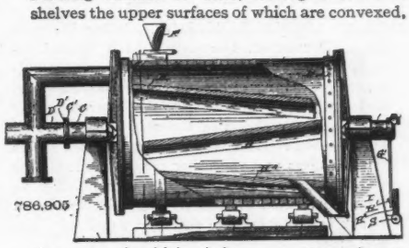
upon the longitudinal upper surfaces of said supporting-belts, unyielding supports extending longitudinally of the upper stretches of said slatted belts, and means for feeding ore to both the upper and lower stretches of the concentrating-belt.

786,814. PROCESS OF TREATING SULPHIDE ORES OR COMPOUNDS PREPARATORY TO SMELTING.—Thomas Huntington and Ferdinand Heberlein, London, England. A process of oxidizing sulphide ores preparatory to their treatment for the reduction of the metal contained therein, such process consisting in heating and working the ore until a portion of the sulphur is removed, rapidly cooling the ore down to atmospheric temperature or thereabout, re-starting combustion in the mass and forcing air therethrough for the purpose of further desulphurizing and oxidizing the same.

786,854. PUMPING-JACK FOR OIL-WELLS.—Rolland G. Strother, Findlay, Ohio. A base having a plurality of spaced blocks disposed in two sets in alignment with each other, uprights mounted between and extending upwardly from the outer blocks, inclined braces for said uprights, abutments secured upon the latter, a cross-head engaging the uprights and moving vertically upon the latter, spaced blocks arranged in pairs upon the under side of said cross-head, operating-levers pivotally connected with said blocks, auxiliary levers connected with the operating-levers between the ends of the latter by means of transverse rods, pivotal connecting means between the lower ends of said auxiliary levers and the base-blocks, operating-bars, and a transverse rod connecting the latter with the free ends of the operating-levers.

786,859. METHOD OF HEATING CARBON ARTICLES.—Frank J. Tone, Niagara Falls, N. Y. A method of heating carbon articles, which consists in placing the articles in proximity to, but out of contact with, an electric resistance-conductor, the intermediate space serving as an insulator of electricity but a conductor of heat, and passing an electric current through the conductor.

786,905. ORE-ROASTING FURNACE.—Albert C. Johnson, Baltimore, Md. A rocking ore-roasting furnace or drier, having a series of shelves the upper surfaces of which are convexed,


786,905.

the axes of which shelves are at angles to one another and lengthwise of the furnace, the alternate ends of said shelves being free, and means for rocking the furnace.

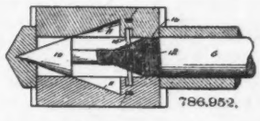
786,922. CENTRIFUGAL PUMP.—Edward L. Smith, Breckenridge, Colo., and John M. Sherrerd, Easton, Pa. A combination, with the casing and runner of a centrifugal pump, of a wear-resisting lining for said casing and runner, the lining for the runner comprising a plurality of screw-like-formed members.

786,923. PROCESS OF FORMING TUBES.—Lester C. Smith, Rome, N. Y. A process of forming a tube from a strip of sheet material in four operations, which consists, first, in turning in the edges of the strip to a curvature substantially that of the circle of the completed tube; second, in bending the strip along the middle to a curvature less than that of the circle of the completed tube; third, closing the tube into an oval form with the meeting edges in the large end of the oval, and, fourth, forming the last-mentioned form into a circular form.

786,926. LORRY OR DUMPING-CAR.—Charles H. Wellman and John W. Seaver, Cleveland, Ohio, assignors to the Wellman-Seaver-Morgan Company, Cleveland, Ohio. The combination of a lorry or car, a vertical shaft on the car, means for turning said shaft, and horizontal arms or blades on the shaft adapted to force material into the lorry or car when the shaft is turned.

786,946. MEANS FOR RECOVERING MAGNETIC IRON FROM ORE-SEPARATING TANKS.—Erastus S. Bennett, New York, N. Y. A combination, with a separating-tank, of means for producing a continuous jet or jets for scouring the material in the tank, and a magnetic device for removing from the tank the iron-sand from which the gold has been scoured.

786,952. ROCK-DRILL BIT.—Samuel B. Clark, Denver, Colo., assignor of one-half to John William Graham, Jr., and Stephen Gilbert Shaw


786,952.

Denver, Colo. An expanding-bit for drills comprising a hollow shaft having lateral openings formed therein, laterally moving elongated cutter mounted in said openings and extending longitu-

dinally of the shaft and rotating wedges interposed between said cutters for separating them with a parallel movement and supporting them in a cutting position.

786,968. SPUD-GRIP FOR DREDGES, ETC.—James W. Hollenbeck, Rio Vista, Cal. A toggle-grip for spuds and the like, one of the members of said toggle having means opposite its jointed end for the attachment of a cable or the like.

786,969. STAMP-STEM GUIDE.—Frank W. Hooper, Grass Valley, Cal. A stamp-stem guide comprising a casting having means of attachment with the battery-frame and provided with a socket substantially rectangular in cross-section, the back and front walls of the socket being substantially straight and the side walls converging downwardly, said socket having a passage through the front wall for the lateral admission or removal of a stamp-stem, and a sectional guide-block or box fitting said socket, the sections of said guide-block formed with their opposed abutting edges oppositely inclined relative to each other and to the axis of the bore.

787,018. PENDULUM-MILL.—Julius Wüstenhöfer, Dortmund, Germany. In a pendulum-mill, the combination of a mill-ring with grinding-rollers, a pair of concentric shafts, arms carried by one of said shafts, the intermediately jointed rotary shafts of the said rollers carried by the said arms, gearing between the said shafts of the rollers and the other concentric shaft for rotating the said roller-shafts individually, as they are carried around by the said arms, and means for rotating the shaft provided with the said arms.

787,019. BRICK-MACHINE.—Daniel J. C. Arnold, New London, Ohio, assignor to the Arnold-Creager Company, New London, Ohio. In a brick-machine employing a horizontal pug-mill, a vertical charging-chamber, the pug-mill shaft extending through the charging-chamber, supported in a sleeve bearing in the front plate of the machine, an enlarged hub fixed to the end of said shaft journaling in said sleeve, a crank-pin mounted in said enlarged hub, a pitman journaling on and driven by said crank, a vertically moving plunger mounted in ways supported on the frame, a stud-shaft connected to said plunger projecting outwardly and forming a journal for the pitman.

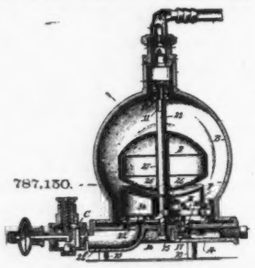
787,131. GAS-FURNACE.—John C. Swindell, Allegheny, Pa. In a gas-furnace, the combination of a furnace-chamber, a subjacent combustion-chamber, a waste-gas channel, one or more, leading out of the combustion-chamber and extending downwardly, a horizontal waste-gas channel, located below and communicating with said downwardly extending channel, a longitudinal partition-wall dividing said horizontal waste-gas channel into sections or compartments which communicate at the end of said channel farther from its discharge, and a horizontal air-supply channel adjoining said horizontal waste-gas channel and communicating by a delivery-port with the combustion-chamber.

787,039. CENTRIFUGAL PUMP.—Elmo G. Harris, Rolla, Mo. In a centrifugal pump, the combination of a rotary propeller-wheel and a casing therefor, having a discharge-space the cross-sectional area of which at any given point is no greater than the opening required to permit passage therethrough, at a velocity equal to the peripheral velocity of the wheel, of the total volume of water discharged from the wheel up to that point.

787,061. GAS-RETORT STANDPIPE.—John H. Taussig, Newark, N. J., assignor to the United Gas Improvement Company, Philadelphia, Pa. In apparatus for the manufacture of coal-gas the combination of a stack of retorts comprising a plurality of benches each containing vertical rows or sets of non-communicating retorts having their mouthpieces in vertical alignment, a series of vertical parallel stand pipes each one of which is straight throughout its length and is connected with the top mouthpiece of a vertical row or set of retorts, and unobstructed gas-passages connecting each mouthpiece with the one vertically above it, whereby all of the retorts of each vertical row continuously discharge through a single standpipe.

787,071. CEMENT-MIXER.—Charles Brent, Rat Portage, Canada, assignor of two-thirds to Archibald Campbell and Archibald MacLaren, Detroit, Mich. The combination of a mixing-chamber, the end plate at one end, the sand-chamber and the cement-chamber secured to said end plate, the shaft extending centrally through the mixing-chamber and centrally through the sand-chamber, beaters or blades on the main shaft within the mixing-chamber and intermeshing gears on the shafts.

787,150. HYDRAULIC AIR-COMPRESSOR.—William G. Cox, New York, N. Y. In hydraulic air-compressors, a base having an inlet-valve and an outlet-valve, a dome secured to the base, a valve-lever pivoted within the dome, arranged to control the inlet-valve and the outlet-valve, closing one and opening the other, a vent-tube fixed within the dome, having communication with the dome and with the outside atmosphere, a tube mounted for movement on the fixed vent-tube, a bonnet-valve having side openings and adapted to normally close the inner end of the vent-tube, the said bonnet-valve having sliding movement relative to the vent-tube, a flange on the upper end of the sliding tube and loosely located within the bonnet-valve, a float having sliding movement on the said movable tube, the said float being adapted to operate on said bonnet-valve and to raise the said movable tube, a




connection between the said movable tube and the valve-lever, and an auxiliary float connected with the said valve-lever, being located below the first-named float, which auxiliary float tends to assist the valve-lever in its upward movement, the two floats being buoyant while immersed in water and acting as weights as the water leaves the dome.

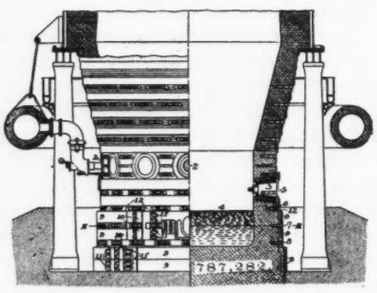
787,189. MINER'S DUMPING-CAGE.—Julia Kerst, Springfield, Ill., administratrix of Frederick C. Kerst, deceased. The combination of a cage, a tilting platform mounted on said cage, oscillative shafts on said platform, a lever connected with one of said shafts, a stop with which said lever engages, keepers on said shafts adapted to fit around the wheels of a car, arms secured to said shafts, and a lever mounted on the platform and connected with said arms.

787,190. MINERAL-VANNER.—Henry C. Krause, Point Mills, Mich. A mineral vanner consisting of a support, an inclined pan, a perforated water-pipe extending across the upper end of the pan, arms pivoted to the support and to the sides of the pan, means for vibrating the pan, and a horizontal sifter of less length than the pan and supported by and above the pan at about midway between the ends thereof, said sifter having a sieve in its bottom, an apertured distributing-plate arranged therein a short distance above the sieve, and having its ends terminating short of the ends of the sifter, and a chute at the end adjacent to the upper end of the pan, said chute projecting beyond the pan.

787,200. MINE-CURTAIN RAISER.—George W. Manlove, Cleveland, Ohio. In combination, a mine-curtain-raising mechanism having a rocking arm therein, an adjacent cylinder with a trunnion-support and having a guide-bracket thereon, there being exhaust-apertures in the cylinder, a piston in the cylinder having a port with a check-valve therein, and a rod connecting the piston and the rocking arm and adapted to operate in the guide-bracket.

787,222. REVERSING-VALVE FOR REGENERATIVE FURNACES.—Josef Reuleaux, Wilkinsburg, Pa., assignor to Alexander Laughlin, Sewickley, Pa. In a reversing-valve, in combination, an upper supply-casing, a lower outlet-casing, upper and lower seal-troughs for such casings, two cylindrical valves working in said seal-troughs and through which the gases pass from the supply-casing to a regenerative flue or which permit the gases to pass from one regenerative flue to the outlet-casing, means for moving the valves lengthwise, and means for maintaining the integrity of one seal of each valve during the movements of the valves.

787,282. MEANS FOR PROTECTING BLAST-FURNACE HEARTHS. Charles E. Dinkey and Hermann A. Brassert, North Braddock, Pa. A blast-furnace having a hearth-wall provided with circular rows of separated holes extending horizontally and inwardly from its outer vertically




extending face below the level of the cinder-notch, and water-cooled plates arranged in series in said holes, the outer vertically extending face of the masonry wall being exposed and accessible between the sides of the plates, and separated horizontal retaining-bands between the rows, the hearth-wall being free from any inclosing jacket.

787,322. ROCK-CRUSHER.—Earle C. Bacon, New York, N. Y. An auxiliary cheek-piece having a shoulder, in combination with a crusher-frame recessed to receive said cheek-piece and support it by said shoulder, and with a fixed jaw, movable jaw, and cheek-plates, the latter supported and held in place by said cheek-pieces and fixed jaw, and means for adjusting said cheek-piece directly laterally toward and from its adjacent cheek-plate.

787,325. APPARATUS FOR CASTING.—Frederick Cowden, Montreal, Canada, assignor of one-half to Robert Samuel Logan, Montreal, Canada. A mold having an ingate and means, inflammable at a comparatively low temperature, for supporting a substance within the mold, such means being located between the ingate and one of the walls of the mold.

## GREAT BRITAIN;

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

*Week Ending April 1, 1905.*

5,259 of 1904. FEED FOR COAL CUTTER.—F. Eckersley, Wakefield. An improved automatic and self-regulating feed for coal-cutting machines.

26,790 of 1904. MAKING PERBORATES.—Deutsche Gold and Silver Scherde Austatt, Frankfort, Germany. Making perborates of magnesium or zinc by mixing a salt of these metals with sodium peroxide and boric acid.

27,991 of 1904. REFRACTORY MATERIAL.—D. B. Williams and J. R. Stauffer, Washington, D. C., U. S. A. Making a highly refractory material by subjecting clay to great heat while enveloped in incandescent coke.

## Special Correspondence.

**San Francisco.** April 18.

The State débris commission has prepared plans for 'losing' the Yuba river, as the project is known, the idea being to remove the river to a new channel, leaving immense deposits of mining débris, sand and gravel in the old channel and directing the stream into Tule basin, some miles below Marysville. At this point future deposits would be beneficial, instead of detrimental, by filling the low lands. Only a small quantity of débris is in the present channel above where the diversion would be made. The plan includes similar treatment of the Bear river and a large amount of dredging. Figures, which are believed to be high estimates, are given as follows: Losing Yuba, with headworks for the storage of sand and gravel, $4,000,000; diverting Bear river into the American river basin, $2,000,000; dredging 60,000,000 cu. yd. of material and building levees at 10 cents a cubic yard, $6,000,000. Total $12,000,000. This includes the cost of lands over which the new channels and storage areas would be constructed. This plan has been discussed for a long time and meets much favor among the leading property owners of Yuba and Sutter counties, as being the best for saving the lands along the rivers from overflow and preserving the rivers and bay for navigation, which are now menaced by 600,000,000 cu. yd. of débris in the Yuba river below Daguerre point.

The California Débris Commission is preparing plans to improve the Bear river in the same manner as is now being done on the Yuba river near Marysville, the narrowing of the channel by training walls, and holding back the heavy mining débris by means of barriers.

A number of Japanese miners who went to Brown's valley, Yuba county, to work on the old dumps, have been practically deported by a committee of the citizens. This is the first attempt of any Japanese to commence work on the mines of California, and the first experience is a discouraging one to them. There are, however, a few thousand Chinese employed in the gravel mines in working for themselves. They will work underground in the drift mines, but seldom do so in quartz mining.

Gravel mining is again coming to the front in Nevada county, where is the North Bloomfield mine, once the greatest hydraulic property in the world, and the one against which the Sawyer decision issued practically closing down all the hydraulic mines in California except those in the northwest counties. A number of properties have recently been bonded, among them the Cricket Hill or Jacobs and Sargeant diggings. This property has been bonded for $200,000 by Geo. S. Sargeant, to San Francisco men. A bond for an equal amount has also been given on another gravel proposition near Nevada City.

The old mining town of Shasta, in the county of that name, was last week rid of the last of the Chinese miners who used to work there. In early days over 1,000 Celestials worked in that vicinity, and several Chinese stores were maintained. The last one of these has closed up, the real estate has been sold, and the Chinese have quit. There are now five Shasta county towns where no Chinese are employed—Redding, Keswick, De Lamar, Kennett and Shasta.

An order has been issued by the Empire Mines Co., of Grass Valley, forbidding any other mining company using water from its pipe lines. This is a matter of vital interest to the other mines on Osborn Hill. The mines of that section have been using water from the Empire pipe for the past ten years, and never dreamed that things would be otherwise. Now they must build a pipe line of their own, or shut down the mines. It will cost several thousands of dollars to construct a new line, and the different companies will probably go in together and do the work. The order of the Empire company goes into effect on May 1, but a suit in equity may be commenced to prevent them from carrying out its intention. It is believed that the other companies may be able to prevent the Empire company from preventing them using the water until they can make suitable arrangements.

Increasing interest in dredging for gold continues to manifest itself, and many large tracts of land have lately been purchased or bonded. A. G. Hanford has four drills at work prospecting lands held under bond by him and his associates. Mr. Hanford has bonds on lands on the north side of the Yuba river as follows: Kupser 600 acres, Shay 180, Diggs 1,100, Pauley 200, O'Brien, Ebert and Mitchell 200; on the south side—O'Brien (including Beeney place), 4,000 acres, Mahoney 160, Curry 320 and Reynolds 240. In addition, 1,400 acres of land within the meander lines of the Yuba river, recently located by Attorney J. E. Ebert and others have been bonded. This lies between the tracts above named. Almost all these are patented lands. The drills have been at work for four or five months and are now on the Pauley place. Three more of the machines will be on the ground shortly and will aid in hurrying the work of prospecting. Surveyors are engaged in running lines, and everything points to the final closing of the deal.

**Denver.** April 21.

The various companies in the Cripple Creek district, as far as known, have during the month of April distributed $436,000 in dividends, the total for the year aggregating about $1,250,000.

Active operations have begun on the extension of the Denver Northwestern & Pacific railroad, from Arrowhead, the present terminus, to Hot Sulphur Springs in Middle Park.

C. C. Parks, receiver of the Boston-Colorado Coal Co., operating at South Cañon, near Glenwood Springs, has sold the property to a syndicate composed partly of the former stockholders.

A few weeks ago, the Morning Glory Mining Co., secured a judgment for $164,000, in its suit against the Mary McKinney Mining Co., which at once appealed the case. It is now stated that the matter has been compromised by the payment of $100,000.

According to a decision of the United States Supreme Court, just rendered, a tunneling company may disregard unpatented intersected claims, while prosecuting its underground operations. A very important determination of this question was the result of a suit of the Creede and Cripple Creek Mining & Milling Co., against the United Tunnel, Mining & Transportation Co. The plaintiff won the injunction suit in the United States District Court, whence it was taken to the Court of Appeals. There an adverse opinion was rendered.

The eight-hour law, passed by the legislature did not make provision for the wheelers and weighers on the charge floors of the smelters, and at the Arkansas Valley plant at Leadville, where these employees were divided in their opinion, whether they would continue under the 10 hour system, or also demand an eight-hour day, some inconvenience was caused to the management by a temporary strike which, however, was of short duration and after a few concessions were granted, most of the old hands returned to work, the vacancies being filled by others.

The Western Federation of Miners will hold a convention at Salt Lake City on May 23, at which the card system, which dicriminates against its members, will be considered, as also the calling of a national convention to consider the amalgamation of all the labor organizations into an industrial union.

A meeting of the Denver branch of the American Peace Congress, to consider the action of the permanent organization on the plan of Henry Scullin, which advocates tolerance, conciliation and peace, was held at the Chamber of Commerce a few days ago, and plans were discussed for active participation in labor disputes. The plan was endorsed by the Board of Supervisors of this city, by resolution.

Attorney-General Miller has filed a motion in the Federal Court, to dismiss the damage suit of Charles H. Moyer, against former Governor Peabody, Sherman M. Bell and Bulkeley Wells for $100,000, for forcible detention by the military during last year's labor troubles, and also to tax the president of the Western Federation of Miners with the costs in the case.

On April 28 and 29, a conference of scientists will be held at Colorado Springs. Professor Chamberlain, of Chicago University and Professor Richter, of the University of Wisconsin, are expected to take part and representatives of the faculties of the State institutions will be in attendance.

Nearly all the machinery at the Denver mint is now in place and the civil service examinations of candidates for the different positions will be held here on May 17, under the direction of the civil service examining board. About 200 employees are needed and July 1 has been set as the date when operations will begin. Up to April 15, $8,347,349 in gold had been deposited to be held for coinage.

**Houghton.** April 22.

Permanent work on the Keweenaw Central railroad, which is to be built 30 miles northward from Calumet to Lac La Belle, in Keweenaw county, was started this week. The road, beginning at the metropolis of the Lake Superior copper district, with a population, including environs, of 50,000 people, and terminating at Lac La Belle, an expanse of water that for beauty is surpassed by few lakes in the country, will have deep water connection at the latter place through a canal half a mile long, opening on Bete Gris, Lake Superior.

The construction of the Keweenaw Central railroad presages an era of activity in Keweenaw county the like of which probably never has been known. There is an immense area of idle and undeveloped mining land in that portion of the Lake Superior district and arrangements have already been perfected for the exploration of large tracts. Other properties will be opened and activity resumed just as soon as modern transportation facilities are available.

While the preliminary survey for the Keweenaw Central railroad has been made

and the topography of the country through which it will run has been charted, the exact route has not been determined. From the data in hand the engineers will soon have the final course staked out, after making allowances for the cuts and fills. A party of surveyors in charge of W. W. Stockley, chief engineer, has pitched a camp a short distance from the Wolverine mine and another party, which has established a camp at Lac La Belle, is working toward the former.

As yet the Calumet terminus of the road is uncertain, but it is probable that the northern yards of either the Copper Range or Mineral Range roads, connection being made with both, will be used. The main line will be laid out so that it will pass close to every mine or promising prospect on its entire course, including the Calumet & Hecla, Centennial, South Kearsarge, Wolverine, North Kearsarge, Ahmeek, Allouez, Phoenix, Mohawk and Bohemian Range. Besides these mines, which are all active at the present time, the road will reach the following properties, where it is probable that work will be resumed as soon as needed transportation facilities can be furnished: Seneca, Lac La Belle, Mandan, Amygdaloid, Arnold, Ashbed, Humboldt and many others. In ascending the rim of the valley to approach Lac La Belle, the road will pass within two miles of Eagle River, the county seat of Keweenaw county, and less than five miles from Eagle harbor. Eventually it is likely that branches will be extended to those places.

Within a short time exploratory work will be begun upon a tract of land near the Bohemian Range Mining Co.'s property in Keweenaw county. The new property is on the Bohemian range and carries the same lodes which are being explored by the Bohemian Range company with favorable results. Boston and Lake Superior people are supplying the funds for the exploratory work, and in the event of a promising showing a mining company will be organized with the usual capitalization. There are 1,440 acres in the new property, and Frank L. Van Orden, superintendent of the Wyandot Copper Co. and consulting engineer to the Bohemian Range Mining Co., will conduct the preliminary investigations.

Arrangements are under way for the organization of a corporation to acquire and operate the old Toltec mine in Ontonagon county. The company will be known as the Toltec Copper Mining Co., and it is expected that the organization will be completed by May 1 and active development work begun immediately thereafter. The Toltec is one of the most important idle mines in Ontonagon county. It was worked from 1855 to 1861 and produced upwards of 1,000,000 lb. of refined copper, yielding many masses of native copper, some weighing as much as 11 tons each. The property comprises 1,120 acres, embracing a large area of land which is traversed by two mineral ranges, known as the Minesota and the Evergreen. The former range includes the beds upon which th Michigan, Rockland and National mines are opened, while the Evergreen belt includes the Butler, Knowlton, Evergreen and other lodes, lying to the southward of the former range, and on which the Mass, Adventure and other mines are developed. The mineral lands of the Toltec lie immediately north of the Ridge, Adventure and Hilton mines. Besides, there is a quantity of timber and ample water is procurable from the streams crossing it and adjoining properties. Easy and cheap transportation facilities are available, the Chicago, Milwaukee and St. Paul, Copper Range and Mineral Range railroads passing close to the property.

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**Scranton.** April 24.

The case of the miner Shaleen who appealed from the judgment of the Lackawanna courts that the State law which provides that an applicant for a miner's certificate must have worked two years in the coal mines of Pennsylvania before he is entitled to one, will be argued in the Superior Court at Pittsburg this week. Whatever way the decision goes, there will be an appeal to the United States Court.

The Delaware and Hudson company will remove the coal pockets from the railway yards at Carbondale and erect them in a more suitable place. As they stand, they are inconveniently located.

President Wilcox, of the Delaware & Hudson company, was in Scranton last week. The object of Mr. Wilcox's visit is understood to be in connection with the plans of the company to make extensive improvements and innovations in their coal property. Some of these are urgent, and others more or less necessary. The directors feel that the company's vast coal properties have not been developed to their fullest productive capacity, or up to the standard of other companies. The Delaware & Hudson possess some of the finest coal properties in the anthracite regions. Two breakers which were destroyed some time ago, have not yet been rebuilt. For other plans in contemplation by the company, a large sum of money will undoubtedly be spent shortly.

The pockets of the J. M. Sherwood breaker at Jermyn collapsed on April 22, and hundreds of tons of coal of various sizes were dumped into a heap with breaker lumber and twisted iron. The collapse was due to decayed timbers. The breaker and pockets were built on the mountain side, and when the crash came some of the coal was projected a great distance. Mr. Sherwood says he will rebuild the pockets at once.

The man Rhodda, of the Hazelton miners' examining board, who swore an affidavit last week that the miners' certificates were handed over to saloon keepers in batches of 600, has been placed under arrest. It is said that the case against him will be pushed.

The State Bureau of Mines, owing to the scandal that has recently originated through the allegation that miners' certificates have been forged, has taken specific precautions to insure that in future examinations for mine foremen, in particular will be unequivocally carried out, according to the intention as well as the letter of the law. Inspector McDonald is one of the most energetic and competent of the board of mine inspectors, and his determination to have these examinations carried out upon specific lines will do something, at least, to mitigate the abnormal accident and death rate among mine workers. Both miners and operators are of one mind in this; that miners' certificates are so much waste paper if they do not represent with fair accuracy qualifications of the miners to whom they are issued.

There were 350 accidents, 100 resulting fatally during the last year in the Hazelton district, the section where James Rhodda, of the miners' examining board, declares that miners' certificates were issued fraudulently.

A party of Cornell students has been visiting the anthracite coal measures of the Lackawanna and Wyoming valleys during the past week. In the party were two Japanese students and one Chinaman who are taking a course in the engineering department of the university.

The output of coal in the anthracite regions is fairly up to the average for this season of the year. The sudden spell of cold weather that we are now experiencing immediately relieved the sluggishness of the coal trade that resulted upon the abnormally mild weather that ushered in the month of April. Reports from the various mining centers up and down the valleys indicate that all the mines are working full time, and at their average capacity. The opening of the lake trade will superinduce greater activity still. It is said that there is not a coal worker idle through slackness of work, and in some localities the demand for miners, miners' laborers, and particularly rockmen is greater than the supply. It is anticipated that these conditions of trade will continue unintermittently during the summer months.

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**Duluth.** ,April 22.

The procession of ore ships began to arrive at the head of the lakes on April 15, and has been continuous since then. Ore is moving freely and will be coming to docks very fast in a few days, as it takes some days to get the machinery of the business running smoothly. The head of the lake ore roads have not yet received much of their new rolling stock or motive power, but new steel cars are beginning to arrive. As there are 1,800 of these and 12 enormous consolidation type locomotives, it is probable the latter will be broken in on some Eastern road and will bring out most of the steel cars themselves. Each of these engines can easily pull 100 of these cars in a load and will quickly fill up the order.

The strike, that seemed at one time to have an ominous look, is over, and the mines at Hibbing are again busy, except those underground properties that were closed down by the strikers; these have not been opened and may not be for some time to come. The mining companies for the past two or three years have been stripping as many of their mines as possible, with this very contingency in view, and now that it has come the wisdom of stripping has been fully demonstrated. It is no small matter to close down an underground mine, and when the striking miners see this going forward, and the pumps pulled, they realize that it means business and they begin to appreciate that the closing of mines that employ four-fifths the labor and provide only half the product, is a matter of some concern to them. Not more than one-tenth the men were in favor of striking at any time, but these were intimidated by the more active tenth, and added to the size of the crowds. The first of this week about 3,000 men were out, and apparently in an ugly mood, but most of them did not know, nor care, what they were out for.

No better time for a strike could have been selected for the mine owners, for the boats that had been expected to arrive and inaugurate the shipping season, had been tied up at the lower end of Lake Superior by ice and would be unable to get through as soon as anticipated, so there was not, and could not be for some days, the pressure for ore the miners had hoped for and expected.

The state has started a case in law to annul the mineral contract held by the assignees of Mabel Evans, on a piece of land presumably of value for iron ore. It adjoins the Alpena-Sauntry mine on the north, and some other fair developments are close by it. It is a narrow strip, land that was no man's land until a short time

go, overlooked in the original surveys. The state's case is ostensibly on account of the allegation that Mabel Evans was simply acting for two of the State land office employees, who were assigned her rights shortly after they withdrew from office. But this is a mere technicality and subterfuge; the real case at issue is one striking at the roots of the system of State leases, by urging that the law under which they are disposed is contrary to the State constitution.

**Butte.** April 19.

Butte and Eastern men have organized the Berlin Mining Co. to develop five claims in the northeast part of the Butte district. These claims are the Berlin, Margaretha, Leaf, Eva and Gustavus, the value of which is undetermined, no work of a substantial nature having been done on any of them.

The Raven company, operating north of this city, has decided to issue bonds to the extent of $65,000 to raise money with which to open its property to a depth of 1,000 ft. or more. The bonds have been subscribed for by Bristol (Conn.) men, represented by F. C. Norton and C. J. Root, who spent several days here last week examining the property. A mortgage will be given on the property to secure the bonds. The shaft on the Raven claim is now 700 ft. deep, and the showing at the bottom is good.

The Amalgamated company will put men to work cleaning up the old smelter of the Colorado company as soon as the frost is out of the ground. While this work is in progress the Butte & Boston will clean up its plant, which is now being closed down. The company expects to secure several tons of copper from the débris. All of the ground beneath the furnaces to a depth of several feet is to be gathered up and shipped to the Washoe plant for treatment. The Parrot mine, closed last week by a restraining order issued from the Federal court at the instigation of the Nipper company, is still out of commission. At the time it was closed its output was only 500 tons of ore per day. The suspension will not interfere with the receipts of tonnage at the Wasnoe plant, in which the ore was being reduced, for the ore formerly sent to the Butte & Boston smelter is now going to the Washoe.

The Old Glory company is extracting about 60 tons of ore per day from its property, and is sending it to the Washoe. The company is using one of the shafts of the Amalgamated as an outlet for its product.

The Reins company has crosscut its 60-ft. vein at a depth of 800 ft., and found some good ore in it. The larger part of the vein will concentrate. The extraction of ore has been resumed in the property, but is not being done on a large scale. The vein between the shaft and large lead is full of rich ore, but it is also well supplied with water. The new pump is handling the flow without trouble.

United Copper is short on ore at present, but expects to overcome the drawback as soon as its new hoisting engine at the Cora mine is ready for work, which will be a week or two yet. It will then commence sinking with a view of opening up new ground. Not much copper is being turned out at the smelter.

The operators of the Atlantic Cable mine, 40 miles west of Butte, are interesting Eastern men in the property, their object being to raise money with which to develop the vein to a considerable depth. The mine is a gold producer and has yielded largely. Solid chunks of gold weighing from 1 to 4 oz. have been found in pockets in the vein.

**Leadville.** April 18.

With the opening of a large body of lead sand in the Coronado, centered in the midst of the immense body of silicious lead ore opened several months ago, has revived the theory that under the city to the west immense orebodies will be found west of the Elk fault. The drifts in the Coronado have been carried to the side lines of the property and the orebody is as strong at this point as in any part of the channel. The ore is dipping to the west, and the theory of practical operators as to the ore being found under the city is no doubt correct. So far the great drawback to opening this section has been the water problem, but the Coronado and Penrose have practically solved this, as the water in that section is under control and the whole section will be drained to a depth of 950 ft. It is very probable that a strong company will take hold of the ground west of Harrison avenue and sink to catch the ore shoot of the Coronado.

Charles R. Osgood and associates have taken a lease and bond on the Ballard and President claims on Breece hill; the option on the two properties calls for $80,000, and it is very probable that it will be lifted. The Ballard was one of the first properties in the camp to find and ship bismuth, and at one time the vein of this rich mineral was 5 ft. wide. Both properties have shipped exceedingly rich ore, running as high as 12 oz. gold per ton. The large bodies of ore in the Bix Six and the Penn trend through the territory of the Ballard-President, and every effort will be made by the new lessees to locate it. At present the shaft on the Ballard is being re-timbered and put in shape.

The north drift in the Cloud City has reached 200 ft, and has cut the parting quartzite, which is heavily stained with mineral; several hundred feet will have to be driven before the ore shoot is reached. The south drift is in 150 ft., and bunches of iron have been found in the white lime. It will take 300 ft. yet of driving to reach the Home Extension.

**Deadwood.** April 21.

The Leroy Gold Mining & Milling Co., Custer, S. D., F. H. Cook, general manager, shipped a carload of ore a few days ago to the American Smelting & Refining Co.'s Omaha plant for treatment. If satisfactory returns are received, the company will immediately install a steam mining plant and develop the vein to a depth of several hundred feet. At 90 ft., the present depth, good values are found in the vein, which is 4 ft. wide.

The Reliance company, of Deadwood, has completed the purchase of its property, the last deed in escrow being taken out of the American National Bank, this city, a few days ago. This gives the company clear title to about 200 acres of choice land in the Portland and Annie Creek districts. It is stated that a large cyanide plant will probably be built on this property next summer.

Charles A. Allen, general manager of the Lucky Strike company, has returned from an Eastern trip in the interest of that concern. He states that the Eastern stockholders are desirous of proceeding at an early date with the construction of a large stamp mill, and that the company's sawmill will soon be started getting out the siding and dimension stuff for the plant.

George P. Baldwin has resigned from the presidency of the Eleventh Hour Gold Mining Co., and has been succeeded by R. B. Adam, a prominent dry goods man of Buffalo. Mr. Baldwin was chosen secretary-treasurer at a director's meeting held in this city last Saturday. The Eleventh Hour sawmill is working full force manufacturing the necessary lumber and timbers for the cyanide plant that is to be erected this summer. John Madill, of Spearfish, is superintendent.

The Big Four Mining & Milling Co. held its annual meeting of stockholders and election of officers in Deadwood recently. G. L. Allen, of Hamburg, Ia., was elected president; A. M. Beal, also of Hamburg, treasurer; B. G. Franklin, of Hamburg, secretary. Sinking will be resumed shortly in the main shaft, which now reaches a depth of 170 ft. It will be continued 200 and possibly 300 ft. farther. P. T. Baird, of Deadwood, is superintendent.

It is quite probable that a cyanide plant will be erected at the famous old Sitting Bull-Richmond mine, at Galena, this summer. This property produced nearly $250,000 in rich gold-silver ores during the early 80s, and large quantities of medium grade stuff that can be now handled by cyaniding at a profit were left standing in the stopes. The dump also contains a quantity of cyaniding material—estimated at from 100,000 to 200,000 tons. Altogether the property is looked upon as having foundation for a paying enterprise.

**Toronto.** April 20.

At a special meeting of the shareholders of the Dominion Coal Co. held at Montreal on April 17, the plan for the reorganization of the company's finances was unanimously ratified, and an issue of $7,000,000 35-year 5 per cent gold bonds authorized. Five millions of these bonds will be issued almost immediately, which will take up the issue of $2,435,000 now outstanding and pay off the floating debt amounting to $2,380,000. The remaining $2,000,000 will be retained in the treasury to be available for future development. An issue of $3,000,000 perferred cumulative 7% stock was also authorized, taking up the present issue of preferred stock, which bears 8% interest. The preferred stock is redeemable in five years after date of issue at $125, the old stock being redeemable any time at $115. The bonds will be issued at 99 and accrued interest and holders of the old bond issue on exchanging them for the new will receive par value and a 10 per cent premium on those they now hold. President James Ross in explaining the arrangement stated that the reorganization would effect a saving in the company's finances of $200,000 per annum during the next five years. Of the issue of new securities 35% had been underwritten by the directors of the company, and the remainder by the Bank of Montreal, the Canadian Bank of Commerce and American banks. The shareholders who do not wish to make the exchange will be paid off in cash about May 15, according to the terms of their securities. The prospects are for a largely increased output from the company's mines this season by reason of the increasing demands of the St. Lawrence trade, as well as additional local consumption. The Dominion Steel & Iron Co., which has decided to erect new coke ovens at Sydney, N. S., has notified the Dominion Coal Co. of its intention to operate three blast furnaces in place of

two as at present, as soon as these coke ovens are completed, and made a requisition for increased supplies of coal.

J. F. Caldwell, who is extensively interested in the Sultana gold mine, Lake of the Woods district, states that ore shoots are being located, four being tributary to the shaft, which is now 600 ft. deep, and that development downward will be continued. The ore at the bottom of the shaft is mostly very free milling, yielding $10 to $12 to the ton.

The Regina gold mine in the neighborhood is also in operation under the direction of Sir Henry Wilkinson, and is yielding good pay ore, its remunerative working being merely a question of economical development and proper management. It has a 30-stamp mill. Mr. Hilary, an English chemist, is in charge of the cyanide plant for treating concentrate.

The works of the International Portland Cement Co., at Hull, Que., have commenced operations, and are turning out a large output. On April 15 they were inspected by Sir Sandford Fleming, president; A. F. McLaren, vice-president; J. S. Irvin, managing director, and a large party of visitors.

An association of mining men from Seine River, Atikokan and Mine Centre has been organized at Fort Frances.

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**Victoria, B. C.** April 18.

From statements attributed to G. O. Buchanan, of Kaslo, the official who checks the tonnage of British Columbia lead ores smelted in the province and distributes the bounty on lead paid by the Dominion, it appears that when the Sullivan Group Co.'s lead smelter shall commence operations, probably next month, the production of metallic lead will be increased to about 24,000 tons per annum. The lead production of the Canadian Smelting Works, Trail, is placed at 8,000 tons per annum, and that of the Hall Mining & Smelting Co.'s smelter, at Nelson, at between 8,000 and 9,000. The Sullivan Co.'s works, at Marysville, East Kootenay, will, it is thought, produce between 7,000 and 8,000 tons. It is estimated that there is now a market in Canada for about 8,000 tons of pig lead yearly, and something like 7,000 tons for paints. Heretofore the supply of paints has been largely imported, but the lead corroding works now in course of erection and equipment at Montreal, Que., will, it is anticipated, provide for the Canadian demand. To secure the trade for the home works the Dominion government has been urged to impose a duty sufficiently high on lead products to effectively protect the Canadian lead manufacturing industry, and it is believed this will be done. It is estimated that the Canadian demand will increase, and a share of the Oriental market will, it is thought, be secured by British Columbia lead, so that the outlook is considered encouraging for the lead mines of this province. The lead bounty will be payable for three years longer, during which period lead miners and smelters expect to be able to place the industry on a payable basis, so as to be able to carry it on profitably after the payment of the bounty shall cease.

Zinc production has had more attention in British Columbia during the six months last than at any previous time in the history of mining in the province. The largest producer thus far has been the Lucky Jim mine, in the eastern part of the Ainsworth mining division, which has been steadily shipping zinc ore and concentrate, via Kaslo, to United States points, since the close of last December. The Slocan Star has come next in point of tonnage shipped, while several other Slocan mines have contributed to the total production. The Bell, at Whitewater, is preparing to maintain a steady production of zinc, and the Antoine, Jackson, and others will also be producers. The south fork of Kaslo creek bids fair to add an appreciably large quota so soon as the snow-slide season shall be past. The zinc plants at Kaslo, in Ainsworth division, and at Rosebery, in Slocan division, will be ready for operation next summer, while the construction of a zinc smelter at Frank, in southwestern Alberta, a few miles east of the British Columbian eastern boundary line, is being energetically proceeded with.

In copper mining there is much activity in the Boundary and Rossland districts, while the coast bids fair to show an increased output next summer, this last to be from the Britannia mines, on Howe sound. All three copper smelters in the Boundary are adding to the treatment capacity of their respective reduction works. Already the output of Boundary ore for this year has reached a total of rather more than 250,000 tons, with preparations being made for an enlarged production. Rossland's output has exceeded 100,000 tons this year, and an aggregate of about 400,000 for 1905 is confidently looked for.

Neither gold nor silver mining has as yet compared favorably with lead or copper, so far as this year's results are concerned, but it is early for these branches of mining to show a large production. In the Slocan, which district produces the chief proportion of the silver output of the province, the rawhiding season is over, and the roads and trails are not yet dry enough for packing or hauling in wagons, consequently the shipment of silver-lead ore is, for the time being, pretty much at a standstill. It is expected, though, that the silver mining districts will produce freely this year. In the gold producing districts of Atlin, Cariboo and East Kootenay active preparations are being made for the season's placer mining. Hydraulicking, dredging and deep drifing will each play an important part in this year's results from placer mining, and an increased total yield is looked for.

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**Mexico.** April 19.

At Velardeña, Durango, the American Smelting & Refining Co. is well along with the grading for the plant and the railroad sidings, and this week S. W. Eccles, of the company, and W. S. Martin, of the International Railroad of Mexico, are both on the ground in consultation over the common interests.

J. J. Gallagher, formerly of Torreon, who has been supervising the stonework of the National Metallurgical Co., at Matehuala, S. L. P., has gone to Velardeña to superintend similar work there.

In the San Dimas district of Durango, it is understood that Messrs. Hearst & Haggin are preparing to put in a 40-stamp mill on the Socabon Tayoltita to take the place of a small 5-stamp experimental plant which was there and has given splendid results. The smelter of the Carmen Copper Co., north of Durango, has closed down, but whether permanently or not cannot be learned.

The ground covering some 27,000 acres in the Almoloya district, near Parral, Chihuahua, which had been held by Miguel Mazatin for several years, but was last month thrown open because of his inability to pay the mining taxes, has been practically all taken up, and new life has been instilled into the camp by the finding of large bodies of the zinc carbonate, which is just now in such demand in the workings of the Almoloya Mining Co., and which has given a boom to that stock in Monterey, where it is largely held.

The Naica, near Couchos, Chihuahua, is shipping 100 tons a day to the Torreon smelter, and paying handsomely besides completing a 15-mile railroad.

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**London.** April 15.

New developments are still being used for the purpose of creating a boom of some sort or other in South African shares. I have recorded several announcements of new discoveries that have been used for a few days. This week a good deal has been heard of the tin lodes that are known to exist in the Pretoria district. So far the information received has been as scanty as in the case of the so-called discoveries of alluvial, tellurides and banket. For a few days there was a little boomlet, but the bears soon got the upper hand. Until further information is available, the ordinary mining man takes little interest in these tin discoveries.

The report of the Mountain Copper Co. shows that in spite of the worries of all sorts that have been gratuitously imposed on the company by its neighbors and others, the business continues in a very strong condition. The produce of copper during 1904 was 10,435 tons of unrefined bars obtained from 184,308 tons of ore. The profit for the year was over £200,000. This and the accumulated profit, undistributed for reasons connected with the local difficulties referred to, have been chiefly applied to the redemption of debentures to the extent of $250,000, according to the scheme decided on two years ago. As your readers know, the smelting works at Keswick will be shortly closed, and operations will be commenced at San Francisco before long, where, in addition to the copper production, sulphuric acid will be made from the low-grade pyrite, and superphosphates manufactured. I have every every reason to believe that the agitation against the fumes at Keswick was not a genuine one, but was organized by people who hoped to make something out of it. If the company had not had a strong man at the helm in the person of C. W. Fielding, the bill for compensation would have been a huge one. As it happened, he pretended to take the agitation seriously, and took prompt steps to move the works to some spot where no objection were possible. The loss to Shasta county consequent on the removal of the works is far greater than any alleged loss and damage due to fumes.

It is interesting to note that, after serious financial vicisstudes during the ten years of its existence, the British Aluminum Co. has now arrived at a satisfactory commercial position. During 1904 a trading profit was made of £55,000. The company is thus able to pay off overdue interest on debentures and preference dividend, and to distribute a dividend on the deferred shares. The whole of the water power available at Foyers is now continuously employed, and the demand for aluminum continues to expand. The directors are therefore proposing to issue £190,000 deferred shares and £300,000 for the purpose of building works at Loch Leven. With the money thus raised, shares in the Loch Leven Water & Electric Power Co. will be bought. The latter company will be entirely under the control of the British Aluminum Co., and will be in the nature

of a subsidiary. The Foyers and Loch Leven enterprises will thus be to a certain extent independent, though under the same control. There appears to be no reason to doubt that the company has a prosperous future before it.

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**Sydney.** March 20.

The Tasmania mine, Beaconsfield (Tas.), crushed 6,280 tons during the month of February, for 4,188 oz. of gold.

Owing to the accumulation of over 10,000 tons of zinc concentrate at the works at Port Pirie, the Broken Hill Proprietary Co. has decided to close down the salt-cake plant for the present. The plant has proved capable of turning out a much larger output than originally anticipated, and as the company has been unable to dispose of the concentrate, no other course was open than to cease operations. One of the objections urged by foreign buyers to the concentrate is the excess of lead; assays, however, indicate that it is not in excess of 9 per cent. The company will now, doubtless, enter upon the production of spelter, for which purpose a sum of £25,000 was set apart from the profits of the last half-year. The Block 14 company is fortunate in having a contract for the supply of about 1,000 tons of zinc concentrate a month. The magnetic separation plant at the Junction North mine, which is designed for the separation of the metals direct from the ore, is now working smoothly. During a recent short run, 250 tons of ore assaying 18% of lead, 11 oz. of silver, and 9% of zinc were put through, and 48.5 tons of concentrate were produced bulking 64% lead, 30 oz. silver, and 7% zinc.

At the North Lyell mine (Tasmania), the work of sinking the main shaft with the object of opening out at the 700 ft. level is being pushed. During February the Mount Lyell company treated 22,732 tons of ore, the metal obtained being 574 tons of copper, 57,640 oz. silver, and 1,617 oz. of gold. The extensive works which this company is erecting at Yarraville, Victoria, for the manufacture of superphosphates, and chemical manures is nearing completion, and Dr. F. J. Howell, formerly chemist to the Department of Agriculture, has assumed charge. The New Chillagoe company treated 2,698 tons of ore during the month, which produced 348 tons of bullion. The O. K. company, at Cloncurry (Q.), is now in a position to maintain a regular output of copper, and arrangements have been made for the transport of the metals and supplies by camel teams.

The Lloyd Copper mine, Burraga (N. S. W.), is in full swing, and during February treated 5,160 tons of ore for 140 tons refined copper, the average being 2.7% copper. One of the large mines, the Nymagee, has been compelled to close down on account of the failure of the water supply.

In the Heemskirk district on the west coast of Tasmania, considerable interest has been aroused by the discovery of what promises to prove an extensive deposit of tin-ore, and a large area of ground has been pegged out. The output of the Briseis tin mines (Tasmania) last month was 46¾ tons black tin. The Mount Bischoff company is fully maintaining its output, and during the month a dividend of 7/6 a share absorbing £4,500 was declared. In Queensland, the returns from the Herberton district for the month amounted to 144 tons of tin ore, valued at £9,230

Wolfram mining in Queensland is being seriously affected by the dry seasons, as the miners are unable to work on their claims. At Hillgrove (N. S. W.), the mining for scheelite is being actively followed, and a good supply of ore is being obtained.

The coal trade in New South Wales remains very slack. The colliery employees have decided to ask the government to appoint a royal commission to inquire into the matter of wages paid, the standard of living among miners and the general condition of the industry.

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**Johannesburg.** March 27.

This is the harvest time of the year for annual reports of mining companies. All of them are cheery, and when compared with the outlook at the last annual harvest, they have just cause to be so. These reports are retrospective and prospective. Nearly all of them show what great benefit has already been derived from a largely augmented labor supply. The prospects for the future are rosy, provided the Home Government does not upset the arrangements that have been made for the supply of cheap, unskilled labor. Naturally, the chairmen at the meetings have taken pains to refute the untrue statements made by politicians at home, for party reasons, regarding the employment of Chinese labor on the Rand. Conspicuous in its hostile attitude is the London *Spectator*, a highly respectable weekly, some of whose statements and arguments prove how dangerous it is for a journal to leave its own domain and lay down the law on subjects with which it is not conversant. The authority of the *Spectator* is great, but the editors know nothing about mining, at least of Transvaal mining. One of their recent cries was that the large influx of Chinese would do away with hundreds of rock-drill miners, as the machines would be replaced by hand labor. Quite true, but nothing could be better for the rock-drill miner. The vast majority of cases of miner's phthisis occur among miners running rock-drills in dusty places. All men who are taken off rock-drills will be placed in charge of gangs of Chinese miners. One white man can on an average 'boss' 26 or 27 Kaffir or Chinese miners. In this proportion his lot is much better than that of a rock-driller, for he acts as an overseer and does not 'eat' as much dust as he does in running a machine-drill. If he is energetic and competent, he is put on contract, and can make almost as much money with his 27 laborers as he could with a rock-drill, with far less effort. If all machine-drills were stopped to-morrow, and hand-drillers substituted, there would be more white men at work underground than at present. More superintendence is required in working the Chinese coolies than with Kaffirs. The skilled artisans of this country have no cause, nor will they have, for enmity toward the Chinese coolies. These annual speeches show clearly how bitterly these people resent the practice of using our domestic affairs for purely party and selfish ends. What do the politicians at home care about the Chinese? Nothing. What do they know about them? Nothing. Were they philanthropists they would begin nearer home, and do something for the white slaves in their own country. Were they in earnest, they would investigate, and find that their accusations are untrue. But they see an opportunity to advance their own ends by leading a tirade against the Transvaal and its ways, little realizing or caring that the industry they abuse is of more importance to the welfare of this country than is the cotton trade to Lancashire.

## Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

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Mr. John B. Farish has gone to Mexico.

Mr. Philip Argall has returned to Denver.

Mr. A. C. Beatty has returned to New York.

Mr. G. L. Davis is visiting the oil fields of Mexico.

Mr. Edward J. Skinner, of Denver, is still in Nicaragua.

Mr. Pope Yeatman has returned to New York from Mexico.

Mr. Millard F. Snyder has returned to Salt Lake City from New York.

Mr. Barry Searle has left for Mexico in company with Mr. W. C. Greene.

Mr. Frank H. Probert, of Los Angeles, has returned from Prescott, Arizona.

Mr. C. A. Bohn is examining mining properties in various parts of Mexico.

Mr. W. E. Defty, of Phoenix, Arizona, will be in Sonora, Mexico, until May 15.

Mr. L. W. Strauss has returned from inspecting mines near Chloride, Arizona.

Mr. William S. Hulton, of Washington, D. C., is examining properties in Mexico.

Mr. F. C. Roberts, of Berkeley, Cal., is examining mines in Shasta county, California.

Mr. F. L. Bosqui, now at Goldfield, Nevada, is going shortly to Guanajuato, Mexico.

Mr. C. H. Reed, of Chicago, has been examining the coal fields of Coahuila, Mexico.

Mr. Tenney C. De Sollar is at the United Elkhorn mines, near Baker City, Oregon.

Mr. A. Stewart May, lately in Rhodesia, passed through New York on his way to Georgia.

Mr. Walter H. Bunce has returned to Denver after several months' work in Nicaragua.

Mr. Ferdinand Ditzsch has returned to London after spending six months in northern Burmah.

Mr. E. A. H. Tays has returned to Fuerte, Sinaloa, from examining mines in Durango, Mexico.

Mr. William R. Scott arrived on the *Etruria*, and has left New York on his way to Chihuahua, Mexico.

Mr. Joseph Hyde Pratt, of New York and Chapel Hill, N. C., will be absent in Arizona for several weeks.

Mr. Theo. F. Van Wagenen, formerly at Denver and now manager of the Rhodesia Goldfields, Ltd., is in London.

Mr. J. W. Duntley, president of the Chicago Pneumatic Tool Co., sailed on April 18, for a five weeks' trip in Europe.

Mr. S. W. Eccles, of the American Smelting & Refining Co., is on a trip to the various plants of the company in Mexico.

Mr. I. Wayne Von Leer has been appointed general manager of El Carmen Copper Co., at El Carmen, Durango, Mexico.

Mr. H. E. Whipple, Los Angeles, is in Sonora, Mexico, arranging for a cyanide plant for the Cerro Prieto Mining Company.

Mr. E. G. Spilsbury has gone to Cuba.

Mr. F. H. Minard, of Denver, is in New York.

Mr. Orrville C. Perry, of Oroville, Cal., is in New York.

Mr. Blamey Stevens, lately at Valdez, in Alaska, is now in New York.

Mr. James Phillips, Jr., has been chosen a director of the Utah Consolidated Mining Co., to succeed Theodore Casey, deceased.

Mr. P. A. Mosman has been appointed superintendent of the smelter at East Helena, Montana, to succeed Mr. W. W. Norton.

Mr. A. P. Lowe, of the Geological Survey of Canada, will shortly leave for Hudson Bay, to take charge of an Arctic expedition.

Mr. J. J. Deming has been appointed superintendent of the Gold Eagle mine, near Neil, Idaho, to succeed Mr. W. D. Southworth.

Mr. E. C. Small has been examining properties in Guerrero, Mexico, in the interest of the American Smelting & Exploration Co.

Mr. W. B. Roberts has been appointed manager for the Goldfield-Herald and the Goldfield-Gladiator companies, at Goldfield, Nevada.

Mr. A. Bosch arrived on the *Pennsylvania*. He has been appointed metallurgical engineer to the Great Western Mining Co., in California.

Mr. C. C. Speiden, manager of the chemical department of A. Klipstein & Co., sails with his family on April 29 for a few weeks' vacation in Europe.

Mr. W. W. Norton, formerly superintendent of the smelter at East Helena, Mont., is now superintendent of the Murray smelter at Salt Lake City.

Mr. A. D. Bailey, representing the Tharsis Copper Co., of Glasgow, Scotland, is at Webbwood, Ont., where the company intends developing a copper prospect.

Mr. P. A. Des Laviers, of St. Paul, has been at Winnipeg, in connection with the installation of additional machinery in the plant of the Winnipeg Stone Company.

Mr. George S. Waterlow, of London, was taken ill while on his way to British Columbia. He underwent an operation for appendicitis and is reported to be recovering.

Mr. C. A. Seley, of the Chicago, Rock Island & Pacific Railroad, delivered an address at Purdue University on April 11. His subject was 'Framing of Passenger and Freight Cars.

Mr. W. E. Zwicky, general manager of the Rambler-Cariboo Mines, Ltd., has returned to Kaslo after having spent several weeks visiting the mining centers of Colorado and Montana.

Mr. Robert G. Reilly, formerly of the Liberty Bell Gold Mining Co., of Telluride, Colorado, is superintendent of the Mount Glines Gold & Silver Mining Co., at Milton Plantation, Maine.

Senators Hemenway, Proctor and Lattimer, and Representatives McCreary, Blackburn and Cannon are included in a party which is inspecting the property of the Greene Consolidated Copper Co. in Mexico.

Mr. Josef Reuleaux, for many years engineer with Messrs. Alex. Laughlin & Co., Pittsburg, Pa., has severed his connection with that firm. He sailed for Europe on the *Vaderland*, and will remain at Liège, Belgium, during the international exposition.

## Obituary.

Albert A. Wright, since 1874 professor of geology and zoology at Oberlin College, died at Oberlin as a result of a stroke of paralysis on April 2, aged 59 years.

John Graham, a mining engineer, of St. Louis, was killed on April 3, while attempting to rescue the miners burned by the explosion in the Leiter mine at Ziegler, Illinois.

Thomas Reynolds, an expert in mine construction, died recently at Los Angeles, Cal., aged 47 years. Mr. Reynolds was at one time in charge of the mines of the Drum Lummon company, at Butte, Mont., and the Del Mar Mining Co.'s property at Del Mar, Nevada. He contracted a fever in Mexico which resulted in his death.

Bruno Kerl, best known to American students as an authority on metallurgy and assaying, died on March 25, 1905, at the age of 81. He was educated at the gymnasium of Clausthal and the University of Göttingen, where he "specialized" in chemistry, mineralogy, physics and technology. He then obtained some practical experience in metallurgy at Goslar, from which he was called as docent in assaying and metallurgy, to Clausthal. He occupied successively, contemporaneously with his teaching duties, increasingly important positions in government bureaus of the mint and of metallurgy. In 1862 Kerl had become full professor at Clausthal, from which he was called in 1867 to the mining school at Berlin. His official duties and honors also increased, one of his last promotions being a membership of the testing commission of the Royal School of Mines and the Technical High School at Charlottenburg. Kerl's works were many, and they covered not only blowpiping, assaying and metallurgy, as popularly understood, but also saltworks, clays, cements, etc.; also, in concert with Professor Stohmann, of Leipzig (who was later one of the few great authorities on thermo-chemistry), Professor Kerl re-edited Muspratt's seven-volume 'Chemistry in Application to Art and Industry.' He had not been engaged in active work for eight years. Kerl was essentially a metallurgist of the old school.

## Societies and Technical Schools.

*University of Nevada.*—The State Board of Regents has let a contract for the metallurgical building as an addition to the other university buildings. The department of metallurgy has developed to such a marked extent and has become of such importance in the work of universities in general and this institution in particular, that a building devoted exclusively to this science has become a necessity.

*Summer Mining Classes.*—The free classes in mining under the direction of the mining bureau of the province of Ontario will be conducted this year by Dr. W. L. Goodwin, director of the Kingston School of Mines. The dates are as follows: In eastern Ontario, Olden Time mine, April 20; Gray Gold mine, April 29; Jarman Pyrites mine, May 8; Star of the East Gold mine, May 16; Actonvale mine or Lacy mica mine, May 24; Craigmont or Radnor iron mine, June 1. Northern Ontarion, Haileybury, June 16; New Liskeard, June 23; Cobalt, July 3; Creighton, July 13; Shakespeare Gold mine, July 22; Gold Rock, July 31.

## Trade Catalogues.

The Lombard Governor Co., of Ashland, Mass., has issued bulletin No. 103, which describes and illustrates its type N governor.

The Sullivan Machinery Co., of Chicago, Ill., in its bulletin 53 A, describes the Sullivan air compressors, straight line 2-stage classes W B 2 and W B.

The Michaelsen flour gold and platinum machine is described in a booklet issued by the Michaelsen Flour Gold & Platinum Co., of Ogden, Utah.

Part 2 of the general catalogue of Warren Webster & Co., of Camden, N. J., describes and illustrates the Webster feedwater heater and chemical purifier.

Rickard's Corliss steam engines, built by the Corliss Engineering Works, of Philadelphia, Pa., are described and illustrated in a catalogue issued by that company.

The Hunt noiseless conveyor and other machinery for handling coal in power stations are described and illustrated in catalogue No. 053, prepared by the C. W. Hunt Co., of West New Brighton, New York.

The Joshua Hendy Machine Works, of San Francisco, Cal., has issued a new catalogue dealing with gold milling machinery. In this are exhibited half-tone reproductions, descriptive of mining machinery of the company's manufacture.

Catalogue No. 10 A, of the Colorado Iron Works Co., of Denver, Colo., is devoted to the company's cyanide plants, machinery, tanks and appliances. The catalogue is divided into three parts, with special exemplifications of practice, remarks upon ore testing, etc. It is provided with excellent illustrations and a valuable index.

## Industrial.

The Black Mountain Mining Co., whose headquarters are in Chicago, has recently contracted with Allis-Chalmers Co. for one 120-stamp (1,250 lb.) gold mill, with crushing plant and copper plates for amalgamating, to be erected at the mines which they are developing at Magdalena, Sonora, Mexico. This company has taken hold of an old property, which was not yielding what it should, and is operating it on a much larger scale than heretofore. The tailing from the plant will be treated by the cyaniding process.

Through an error in the advertisement of the Nordberg Manufacturing Co., which appeared in the JOURNAL April 13, the four-cylinder Tamarack hoists built for the Tamarack Mining Co., Calumet, Michigan, were described as "hauling loads on rope of 4,200 lb., at a hoisting speed of 3,500 ft. per minute. The facts, as since ascertained, are that the load consists of 6,000 ft. of 1.5 inch rope,=21,800 lb.; cage 4,200 lb.; two cars, 4,000 lb.; rock 12,000 lb., making a total load of 42,000 lb. The speed is 5,000 ft. per min., and the total depth is 6,000 feet.

A large shipment will be made to Mexico through G. & O. Braniff & Company, agents for the Westinghouse Electric & Manufacturing Co., in Mexico. One order is for 22 machines, ranging in output from ¼ to 30 h.p. The Phillipsburg Gas, Light, Heat & Power Co. will soon increase its station capacity by the addition of a 300-kw. generator, a motor-generator set consisting of a 300-h.p. motor and a 200-kw. generator, and two direct-current machines of smaller size. Four 75-kw.

2,200 volt transformers, lightning arresters, choke coils, regulating transformers, switchboard, and arc lamps are also included in the order.

The J. Geo. Leyner Engineering Works Co., of Denver, Colo., manufacturers of rock drills, air compressors, hoisting engines, etc., reports, in addition to various sales of drills, the following recent shipments: Japan—18 by 22 in. simple steam actuated, two-stage air compressor, two 16 by 18 in. two-stage air compressors, direct connected to electric motor, one 12 by 14 in. two-stage air compressor, direct connected to electric motor, three upright duplex steam actuated compressors, 24 water Leyner rock drills. Gunnison irrigation tunnel—One 22 by 26 in. compound steam, two-stage air compressor, one 16 by 18 in. compound steam, two-stage air compressor, one 10 by 12 in. simple steam, single-stage air compressor, two 9 by 12 in. double cylinder, friction clutch, geared hoists, five 80-h.p. boilers, two small vertical boilers, a number of water Leyner drills, mine cars, etc.

The Colorado Iron Works Co., of Denver, Colo, reports recent shipments as follows: One carload of smelting machinery to the Lost Packer company, in Idaho; two carloads of concentrating machinery to the El Cobre company, in Cuba; three carloads of smelting machinery and equipments to the National Metallurgical Co., in Mexico; one carload of smelting machinery to the Mowry Mines Co., in Arizona; impact screens to the Western Ore Supply Co., in Utah, and the Economic Gold Extraction Co., in Colorado; a special order of slag trucks for the R. J. C. Mining Co., in Mexico; smelting equipments, consisting of jackets and special machinery, for the North American Copper Co., in Wyoming, and smelting machinery and supplies to the Independent S. & R. Company, in Colorado. The large 48 by 160 silver-lead furnace for the Compagnie Française des Mines du Laurium, operating in Greece, will be shipped in a few days.

Among recent orders booked by the Fred M. Prescott Steam Pump Co., Milwaukee, Wis., are the following: From the Pewabic company, Iron Mountain, Mich., one triple-expansion mine pumping engine with a capacity of 1,500 gal. per minute against a vertical head of 1,000 ft. From the Copper Queen Consolidated Mining Co., Bisbee, Ariz., one compound and condensing mine pumping engine with a capacity of 600 gal. per minute against 1,250 ft. head. From other sources, three deep mine pumps, with condensers, with capacities of 1,000 gal. per minute each against a vertical head of 1,200 ft., and driven by cross-compound engines at a piston speed of 350 ft. per minute; one compound and condensing mine pumping engine, with a capacity of 900 gal. per minute against a vertical head of 1,000 ft.; two compound and condensing pumping engines with a capacity of 500 gal. per minute each against a vertical head each of 1,000 ft.; one Duplex mine pump, with a capacity of 1,000 gal. per minute against a vertical head of 500 ft.; one Duplex mine pump with a capacity of 600 gal. per minute against a vertical head of 500 ft. From the American Smelting & Refining Co., Omaha, Neb., one Duplex pot form converter pump with a capacity of 250 gal. per minute against a pressure of 500 lb. per square inch. From the Calumet & Pittsburg Mining Co., Bisbee, Ariz., one independent air pump and condenser with a capacity of 20,000 lb. of steam per hour.

## General Mining News.

### ARIZONA.

COCHISE COUNTY.

*Paradise.*—The crosscut which the Chiricahua Development Co. is driving from the main shaft at the 385-ft. level to cut the ledge is now in about 200 ft. The shaft continues to go down, and is now at a depth of about 450 ft. At the Mars shaft of this company good smelting ore continues to come to the surface. James H. Knowles, who has had charge of the property since the work began, has resigned. Fred W. Hoar, former superintendent of the Old Dominion, at Globe, Ariz., and now a resident of El Paso, Tex., has assumed charge.

At the Leadville work has been discontinued, owing to water. The lessees are unable to handle it without machinery. No information at the present time whether they will start up again or not, but it is reported that new people will take hold of the property.

The Cochise Consolidated Copper Co. has temporarily suspended work, pending the arrival of machinery. The company expects to have its hoists, pumps and concentrator erected as soon as the machinery arrives.

At the Oregon, Cummings and Memingen are making good progress in their crosscut, which they are driving to cut the ledge. They have encountered in the breast of the crosscut iron sulphurets, indicating they are used in the mineral zone, and each foot shows improvement. It is high grade, carrying 17% copper, some gold and silver.

PINAL COUNTY.

*Michigan-Arizona Mining Co.*—This company is opening a large deposit of carbonate copper ore averaging about 13%. The deposit comes up near the top and shows a width of nearly 250 ft. At the bottom of a 50-ft. shaft a crosscut run 80 ft. all shows the same character of ore and no signs of either wall having been encountered. Active preparations and development are in progress.

### CALIFORNIA.

AMADOR COUNTY.

*Zeila Mining Co.*—The machinery for the new hoist of this mine at Jackson is being put in place as rapidly as possible.

*Del Monte Mining Co.*—An assessment has been levied to make a payment on the purchase price, due in June. An orebody has been developed which will require a larger mill than they now have.

BUTTE COUNTY.

*Grizzly Bear.*—H. Robbins and H. Quimby, of Gridley, have found the pay channel in this mine near Sterling City, on the West Branch.

CALAVERAS COUNTY.

*Rough Diamond.*—Hughes Bros. & Dickman are opening one of the old tunnels at this mine in Chili Gulch near Mokelumne hill. This is a gravel property which was partly worked in 1861 by a French company.

*California Placer Mining Co.*—The Marshall mine, owned by this company, has been started up again with a full force of men.

*Hagerman.*—A sale of this mine, near San Andreas, has been made to the Eastland-Gray company of Oakland, and work is being continued vigorously.

*Macaroni Flat.*—The old Chase ditch on the San Domingo has been sold and will be utilized in conjunction with extensive hydraulic operations at this place. Attempts have been made to drift the ground, but they have been failures. The ground is owned by F. A. Mitchler, O. D. Harrington, Eugene Gardella and Mr. Roberts.

EL DORADO COUNTY.

*Rebel Hill.*—A force of men has been set at work on this hydraulic mine.

*Hanson.*—The mill has been started up at this mine, on a satisfactory grade of ore.

INYO COUNTY.

*Keane Wonder.*—It is reported that Capt. De La Mar has forfeited $40,000 paid on his $200,000 bond on this mine in the Funeral Range.

KERN COUNTY.

*Hamilton.*—At this mine, Rosamond, the mill has again started up.

*Fairview.*—The mill at this mine at Rosamond is to be increased to 15 stamps and moved up to the mine.

MADEIRA COUNTY.

*Lucky Bill.*—In this mine at Grub Gulch, owned by S. W. Westall and others, a large ledge of good grade ore has been found.

NEVADA COUNTY.

*De Compton.*—A strike of very rich ore has been made at the 400 level of this mine, Nevada City.

*Chicago Mining Co.*—This company, at Nevada City, has purchased the Oliver placer above old Flat, thus increasing its mineral holdings to sixty acres.

*Lindsay.*—Work has commenced on this mine at Maybert to reopen it, with Henry Kaler as superintendent.

*Blue Tent.*—This drift-gravel mine, six miles from Nevada City, is milling 200 tons of gravel daily, with its 20-stamp mill. Sixty-five men are working, with Clifford Graham as superintendent.

PLACER COUNTY.

*Hidden Treasure Mining Co.*—At this extensive drift mine at Bullion, Harold T. Power, general manager, they are boring a 10-in. hole in the bottom of the shaft to meet the upraise from the tunnel, to let the water out of the shaft into the tunnel, which is now two miles long.

RIVERSIDE COUNTY.

*United States Tin Co.*—The first carload of copper ore from the mines of this company, near Corona, has been shipped.

SHASTA COUNTY.

*Marina Marsicano Mining Co.*—At this property, Ono, L. F. Barlow, manager, 10 men are at work. A new 5-stamp mill has been completed, and machinery for a concentrating plant and aerial tramway has been shipped. A cyanide plant is shortly to be installed.

*Gold King Mining Co.*—E. P. Connor and son have sold to this company the Montezuma group of mines, on Clear Creek.

TRINITY COUNTY.

*Altoona.*—This quicksilver mine at Cinnabar has been leased to Chas. M. Butler and Geo. Grotefend, who will begin at once exploring the property. A Swedish company has bought the old dumps, and will start up the furnaces.

*Brown Bear.*—Leasers are working this mine at Deadwood, and the mill is now crushing ore for them.

*Frick & Davis.*—J. H. Covode, the owner of this mine at Deadwood, has shipped machinery for sinking on the ledge and the mine will be thoroughly developed.

TUOLUMNE COUNTY.

*Eagle Bluff.*—After an inspection of this property by the owners, arrangements are being made for the erection of a mill.

*Clio.*—Electric power machinery is being installed and 30 men are employed at this mine.

*Davis.*—At this mine near Sugar Pine, Dr. Allen, of Los Angeles, is preparing to build a 5-stamp mill.

*Confidence.*—This mine at Confidence has been compelled to close down temporarily by reason of lack of dry wood for fuel.

## COLORADO.

CLEAR CREEK COUNTY.

*East Griffith.*—A large body of $40 ore has been opened up in the 1,500-ft. station of the tunnel level, and a streak of high-grade ore carries values of as high as $1,000 per ton. W. D. Hoover, of Denver, is the owner of this property near Georgetown.

*Treasure Vault.*—Idaho Springs leasers have cleaned up about $100 per day for work in an old stope, their first-class ores netting $115 per ton, and their low-grade ores going $20 per ton.

*Consolidated Alpine Gold & Silver Mining Co.*—The affairs of this company have been adjusted and its mill is to start up under management of E. Schoelkopf, of Idaho Springs.

*Colorado Development & Investment Co.*—This company, operating the Rockford tunnel on Turkey creek, will install an air compressor plant at an early date to facilitate early developments.

GILPIN COUNTY.

*Avon.*—Philadelphia owners are arranging for a resumption of operation on the group on Quartz hill, and their stamp mill in Nevada gulch, sufficient water for the latter being easily obtained from Nevada gulch for a few months, after which supply will be gotten from nearby mines. W. C. Denison, Central City, is manager, and the main supply of the ores will come from the San Juan mine, handled through tunnel and then by tramway to mill.

*Roderick Dhu Gold Mining Co.*—Operations are being carried on in the Protection shaft by local lessees, who are shipping from 2 to 3 cords daily to stamp mills, averaging 2½ oz. gold and up per cord. Arrangements are soon to be made to carry on operations in the main, or No. 485 shaft, which will mean the installation of an air compressor. J. C. Fleschhutz, Central City, is manager.

*Cotton.*—A rich strike has been made in this claim of the Nemeha group, Bobtail hill, which shows a small streak of ore carrying assay values of over 3.5 oz. gold and 100 oz. silver per ton. E. S. Moulton, Central City, is the owner.

*Old Town Consolidated Mining Co.*—Another monthly dividend of $15,000 has been paid to the stockholders of this company, operating in Russell gulch, making the fourth monthly dividend, or $60,000, paid inside of six months. Average daily shipments reach about 100 tons of company and leaser ores, and the average is very good. G. K. Kimball, Jr., of Idaho Springs, is manager, and a recent examination of the property showed ore reserves of about $750,000.

*Gold Dirt Mining & Milling Co.*—Bad weather has interfered with the erection of the new 50-ton amalgamating, concentrating and cyaniding plant in Gambell gulch, which is expected to be finished by June 1. A large office and laboratory office is being built near to the mill buildings, and liberal developments are being kept up in the mines. Machinery for the new mill is delayed on account of a fire and subsequent cave-in of Tunnel 20 on the Moffat road. J. R. Anderson, Rollinsville, is manager, and A. Titus, of Silver City, Ida., has taken charge this week as superintendent of mines and mill.

*Hope and Parker.*—Boston parties are interested at this property, near Phoenix, and they are going to install a plant of machinery for deeper operations. J. O. Emerson, Rollinsville, is in charge.

*Saratoga.*—It is reported that an option has been given on these properties in the Russell district by Messrs. Morgan and Owen, of Idaho Springs, to A. A. Ireland, of Golden, and C. A. King, of Idaho Springs, who represent varied Eastern interests. The vein has been cut in the Newhouse tunnel during the present month, at a depth of nearly 1,500 ft., and is reported to be a strong vein, with every characteristic of the Saratoga. The Newhouse tunnel is to be driven ahead by Messrs. Morgan and Owen, as per agreement with the tunnel owners, and arrangements will be made to take out ores from the Saratoga, as well as arrangements being contemplated by owners of properties in the Russell district to run laterals from the tunnel to their own, which would also prove a great advantage to the entire district in the shape of drainage.

*Boston.*—M. Kane, of Perigo, is driving a tunnel on Stewart mountain, and he has opened up ores which carry values of from 15 to 20 oz. gold, 50 oz. silver and a good percentage of copper, or over $400 per ton. Outside parties are said to be dickering for the property.

*Mountain Monarch Mining Co.*—Centreville (Ia.) parties are interested in a group of claims in Gambell gulch, and they are figuring on the purchase or erection of a 10-stamp amalgamating and concentrating mill in Gambell gulch. J. C. Barrows, Rollinsville, is manager.

*Penobscot Gold Mining & Milling Co.*—Valley Falls (Kan.) parties are interested and they intend the erection of a 25-ton plant for the treatment of their own ores in Independent district. P. J. Hamble, Perigo, is manager.

*Cashier Gold Mining & Reduction Co.*—A shipment of first-class ores from the 600 east level of Pittsburg mine brought net returns of $157, while a shipment of second-class netted $115. The company pays regular monthly dividends. B. L. Campbell, Central City, is superintendent.

LAKE COUNTY—LEADVILLE.

*Mammoth*—Big Evans gulch. A contract has been let to sink a shaft 500 ft. or deeper, if necessary, and the work has been started. Several years ago a drill hole was put down in this ground and a little over 400 ft. a 17-ft. body of carbonate ore was struck, and 48 ft. further down 10 ft. of sulphide was found. There is enough money behind the enterprise to open up both channels of ore, and if it proves to be in paying quantities several other properties in that section will start up.

*The Brattleboro*—Little Ellen hill, South Evans. The water in this shaft is nearly out, and the bottom will be reached this week. After a little repair work is done in the shaft work will be carried on in one of the drifts, where there is a body of ore 8 ft. wide, and of a fair grade.

*Lower Rock Hill.*—The new shafts being sunk on the Parson, Frank and Mike claims are progressing satisfactorily; in the two former the shafts are still in the wash, while in the latter the shaft is well into the lake bedding. The water that was struck a few weeks ago has disappeared, and the big Cameron pump will be taken and a small sinker put in its place.

*The Big Chief.*—From the Castle View shaft on this property 150 tons daily continue to be shipped of argentiferous iron and lead carbonate.

*The Penrose.*—The pumps at this property are beating the water down at the rate of 5 ft. every 24 hours, and another month should see the bottom of the shaft.

## INDIANA.

A large transfer of Sullivan county coal lands, involving a cash consideration of $300,000, has been made to John R. Walsh, who owns the Southern Indiana railroad to the Linton Semi-Block Coal Co., of Linton, Green county. The lands were transferred by C. W. Miller, Attorney General; Daniel E. Storms, Secretary of State; N. U. Hill, State Treasurer, and D. E. Sherrick, State Auditor, who bought them a few years ago as a speculative investment. The 1,600 acres involved are said to be underlaid with a 7-ft. 8-in. vein of No. 4 coal, and is thought to be one of the most valuable tracts in the county, the whole of which is now being tested for coal. The purchase by the Walsh syndicate of such an important holding of coal lands is of interest, especially in view of the generally accepted fact that the Deering Coal Co., backed by the Rock Island interests, is in the same field to fight Walsh and all Walsh's interests. That company has recently made purchases of large tracts of Indiana coal lands, and is thought to be reaching out for more. Since the beginning of the aggressive fight for southern Indiana railway business and his independent development of the stone and coal fields of the counties into which his lines penetrate, Mr. Walsh has had to fight the Rock Island, the Pennsylvania and the New York Central, represented by the local and subsidiary lines.

The deals to control the traffic in Indiana coal will not be completed until at least three, and perhaps four, merger companies have been formed, including the Deering company, which has about 20 mines on the Chicago & Eastern Illinois, and the Evansville & Terre Haute roads. The next largest company is that being organized in the interest of the Southern Indiana road and which now has five modern mines. An operator thoroughly conversant with the situation says: "I do not believe there will be a final merger into one company, because the several railroad interests would prevent it, but after the several groups of merger companies are formed, no doubt there will be an agreement fixing a minimum price at which coal will be sold at the mines."

R. R. Hammond, president of the Deering company, and J. K. Deering, one of the principal stockholders, in company with Jacob Wooley, Jr. and Harry Maden, prominent E. & T. railroad men, have been making a tour of the mines in Indiana which the syndicate has recently acquired.

Roscoe Hedrick has entered, in the Gibson circuit court, a plea of not guilty of unlawfully drilling and blasting in the Princeton coal mines. According to Mine

Inspector Epperson's report, Hedrick placed the shot which caused the mine disaster on March 22, when seven men were killed outright and four others seriously injured. Hedrick was arrested on information of Prosecutor Duncan. It is alleged that the shot was placed six feet in solid when one foot is the limit. Hedrick will be tried in May, and being the first prosecution under the new shot-firing law, considerable interest is manifested in the result.

Conditions in the Indiana oilfield are not what they should be at this season of the year, and drilling is at a low ebb. Hundreds of idle oil workers are in the State, all waiting for a change in the situation that will afford them a summer's work.

## MICHIGAN.

### HOUGHTON COUNTY—COPPER.

*Centennial.*—Opening work is being pushed and additional drills placed in commission as room can be found for them. In Jaunary the mill operated two shifts, and the rock stamped averaged 13.44% mineral. In February the rock averaged 15.54%, running two shifts until the last week, when a change was made to day shift. In March, running one shift, a percentage of 20.17 was obtained, while in the first 10 days of April the rock averaged 22.8% mineral. Refined copper product for the year has been as follows: January, 71 tons; February, 58 tons; March, 59 tons. During the first six months that the mill was in commission the rock discard at the mine was only 5%, while now it is 25%. Development work in March showed a gain, 835 ft. of ground being opened, stoping aggregating 362 fathoms.

*Isle Royale.*—Improved results are being secured. Rock shipments have been increased gradually during the past three months, and now average 600 tons per day. There has been some improvement in the character of the rock, due mainly to the better grade obtained from the exploratory haft on section 11. The coming summer will witness considerable activity. The opening of a permanent shaft on section 11, and a thorough exploration of the southern end of the property with the diamond drill is planned. Openings tributary to No. 2 shaft at the older portion of the mine are encouraging, particularly in the ground south on the lower levels. It is expected work in the drift south on the Portage vein at the second level will be resumed immediately, and a new shaft on that formation is one of the possibilities of the summer.

*Osceola Consolidated.*—Work at the North and South Kearsarge branches is still suspended, owing to the strike of the trammers. The miners are willing to work, but the trammers will not let them. Repairs to the stamp mill are progressing more rapidly now, the strike and resultant curtailment of production facilitating the work. Already three heads have been converted to the steeple compound type and three more will be remodeled at once. The Osceola's milling capacity is being greatly enlarged by the changes completed and under way, and before the end of the year it is expected that facilities will be available for the treatment of 5,000 tons of rock daily.

*Tamarack.*—The remodeling of one simple head has been completed. It is not the plan of the management to convert any more of the heads to the compound type until the one in commission has been exhaustively tested on the conglomerate rock and demonstrated its efficiency.

*Wolverine.*—After remaining idle two weeks, the trammers and other underground men decided to return to work this week. There were only 100 men out on strike, but they prevented 300 other employes from working. Inasmuch as the strikers at the Wolverine, Franklin, Osceola, Quincy and Franklin Junior mines were forced to return to work without their demands being granted, it is believed that there will be no further trouble in the lake district. While the Western Federation of Miners has agitators at work among the employees and has succeeded in forming a number of unions, the district, as a whole, is far from being organized, and the more conservative workingmen do not look with favor on radical action.

### KEWEENAW COUNTY—COPPER.

*Allouez.*—Work of cutting the plat at the third level has been started. The lode is improving as depth increases, and it is expected that there will be sufficient lateral openings to permit production in four months. Drifting on the first and second levels is under way, and will be started on the third as soon as the plant is finished.

### ONTONAGON COUNTY—COPPER.

*Victoria.*—Work on the stamp mill, which is to be erected during the coming summer, will be started in a short time. The machinery is on the ground, and much of the timber is there. Work in the mine is suspended pending the completion of the hydraulic plant, but will be resumed in a few months.

## PENNSYLVANIA.

### ANTHRACITE COAL.

*Pennsylvania Coal Co.*—No. 6 shaft of this company, at Pittston, has resumed operations. Extensive improvements have been made, including the raising of the level of the head of the shaft, so that the loaded cars will run to the breaker by gravity. The interior of the mine was cleaned, also. A large fan has been installed in No. 14 colliery. It is of the same plan that is in general use in all the mines of this company.

*Lehigh Valley Coal Co.*—Blackwood colliery of this company has undergone extensive improvements. The breaker has been equipped with machinery, and a machine shop has been installed on the premises. Operations will be resumed about June 1.

*Philadelphia & Reading Coal & Iron Co.*—This company will soon install a turbine pump to be operated by electricity, at its mine at North Franklin.

### BITUMINOUS COAL.

*James & Laughlin Co.*—This company has purchased about 225 acres of coal land in Centerville borough, Washington county, at a reported price of $500 an acre.

*Pittsburg & Buffalo Coal Co.*—The Hazel mine of this company, at Pittsburg, has been put in operation after an idleness of some months, during which a number of improvements were made.

*Pittsburg Coal Co.*—This company has closed its five mines at McDonald, and one mine at Oakley, causing the idleness of about 800 men. This action is said to be due to overproduction.

*Monongahela Consolidated Coal & Coke Co.*—The large towboat *Cyclone* owned by this company was burned near McKeesport on April 15. The loss is about $40,000.

*Chartiers Coal & Coke Co.*—This company has purchased 484 acres of coal land near Oakdale on the Panhandle railroad. The price is said to be $95,000. The same company has purchased 40 acres on the Toms Run branch of the Pittsburg & Lake Erie railroad at a reported price of $50,000.

## UTAH.

### BOX ELDER COUNTY.

*Boston & Terrace.*—This company, which is developing a property in the Newfoundland mining district, is taking steps to patent its claims.

### PIUTE COUNTY.

*Annie Laurie.*—The No. 5 adit, through which ore of this mine will pass to the mill in the future, is scheduled to go into commission on May 1. The tunnel will greatly reduce the cost of mining, doing away with the necessity of a gravity tramway and the mine hoisting plant.

*Annie Laurie Extension.*—Drifting is in progress on the ledge encountered recently and a large body of mill stuff has been exposed.

### SALT LAKE COUNTY.

*Columbus Consolidated.*—This company is adding more power facilities by the installation of another air compressor, which will make the plant large enough for the operation of 14 drills.

*South Columbus.*—The working force at this property has been temporarily reduced until the Columbus Consolidated completes the installation of its new compressor, from which air will be taken for the operation of machine drills.

*Continental Alta.*—The new mill and tramway of this company is in operation.

*Utah-Apex.*—This company intends to push work on its long tunnel, now in course of construction. The adit will be at least 3,000 ft. in length, will tap the orebodies on the dip at 2,500 ft. depth from the surface and 500 ft. below the present lowest workings. The tunnel will be 6 by 7 ft. in the clear, and will be later electrically equipped. Walter C. Orem, of Salt Lake City, is manager.

*Starlus.*—This Bingham group has been secured on an option by Col. E. A. Wall, of Salt Lake City, and will probably form the basis for a new corporation.

*Kennebec.*—This property, located in the Big Cottonwood district, near Alta, is to be the scene of a vigorous campaign of development, and will be equipped with electric power and compressors. W. J. Craig, of Salt Lake, is manager.

## WASHINGTON.

### FERRY COUNTY.

*Morning Glory.*—Returns from a shipment of 10 tons of ore to the smelter show a value of $130 a ton. The lessees have uncovered the apex of the north-south vein and are stripping ore of 1 to 10 in. in width and sinking on it. An assay of ore from part of the pay streak ran 214 oz. silver and $28 in gold to the ton. Silver occurs in the ore principally as argentite. The north drift on the adit level is in 80 ft. and will have 50 or 60 ft. to run to tap the rake of the surface pay streak, the supposed plane of which is about 45°. The surface streak is producing a half a ton of ore a day.

*Ben Hur.*—The fourth carload of ore since resuming work in the mine was shipped on April 16 to the Britsh Columbia Copper Smelting Co., at Greenwood, B. C. The ore is being drawn from the two pay shoots on the 200-ft. level. Work has not yet been resumed on the 115-ft. level, but

extra men are being employed on the night shift. The machinery is working smoothly and satisfactorily.

*Oversight.*—A new deposit of iron oxide ore has been uncovered at the surface, about 2,000 ft. south of the main shaft, which assays well in gold.

### WEST VIRGINIA.

MCDOWELL COUNTY.

*United States Coal & Coke Co.*—This company, at Gary, has recently put into operation a 750 kw. 6,600 volt generator, directly driven by an Allis cross compound 1,200 h.p. engine, at 125 r.p.m. The company's central power station contains, in addition, two 400 kw. generators, driven by twin simple engines, and contracts will be placed about March 10th for an additional 750 kw. unit. The company is now operating six coaking plants, at distances of one-half mile to three miles, from four sub-stations, using 150 kw. rotary converters to supply 275 volt direct current for mine haulage and coke larries. There are now in use 20 induction motors, at 440 volts, driving crushers, mine fans, pumps, etc., totaling 1,200 h.p. capacity, and 800 h.p. in rotary converters. Two additional sub-stations, one of which will be over half a mile underground, will be added this spring, and four additional rotaries. The operating officials of the company are: J. M. B. Reis, assistant to president, in charge of construction; Howard N. Evanson, chief engineer; and Edw. O'Toole, general superintendent. Geo. R. Wood, of Pittsburg, Pa., is consulting electrical engineer.

## Foreign Mining News.

### AFRICA.

RHODESIA.

The gold production for March is reported by the Chamber of Mines at 34,927 oz. bullion, the highest output ever made in one month. For the three months ending March 31, the total was 97,589 oz. bullion, against 55,809 oz. in 1904; an increase of 41,780 oz. The bullion reported this year was equal to 86,854 oz. fine gold, or $1,795,272 in value.

TRANSVAAL.

The gold production in March was 399,823 oz., an increase of 36,012 oz. over February. For the three months ending March 31 the total was 1,132,892 oz. fine gold, against 886,568 oz. in the first quarter of 1904; an increase of 246,324 oz., or 27.8%, this year.

### AUSTRALIA.

NEW SOUTH WALES.

The output from the gold mines in New South Wales suffers by comparison with the previous year, the yield for the month of February being 16,289 oz. fine, which is 9,645 oz. below that of the same month in 1904. The principal crushing reported is that of the New Hillgrove Proprietary, 320 tons returning 920 oz.

VICTORIA.

The returns from the State of Victoria are quite satisfactory, the yield for the month of February being 63,644 oz. fine, which is an increase of 4,222 oz. fine on the output for the same month in 1904. The mines on the Bendigo Field have contributed the greater portion of the yield, the South New Moon mine being still the chief producer. The center country winze on the New Chum Railway mine ore daily, assaying about 100 oz. silver to has now reached a depth of 4,152 ft. from surface, and at this depth 12 ft. of quartz has been penetrated, all the indications pointing to the fact that this is the cap of the reef. So far, however, only one or two colors of gold have been discerned in the quartz. The work of unwatering the deep leads at Maryborough is in active progress and over 2,000,000 gallons of water are being pumped daily at the Main Leads Consols mine.

### CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

*Boundary Ore Shipments.*—Shipments for the week ending April 8 were as follows in tons; Granby, 11,350; Mother Lode, 2,592; Brooklyn, 3,187; Rawhide, 919; Mountain Rose, 232; Oro Denoro, 165; Winnipeg, 150 tons; Stemwinder Dump, 450; Skylark, 30; Last Chance, 25. Total for week, 19,050 tons. Total for year, 267,113 tons.

BRITISH COLUMBIA-ROSSLAND DISTRICT.

*Rossland Ore Shipments.*—Shipments for the week ending April 8 were as follows, in tons: Le Roi, 2,050; Center Star, 1,643; War Eagle, 1,170; Le Roi No. 2 (milled), 400; Le Roi No. 2, 120; Jumbo, 100; Spitzee, 270. Total for the week, 5,753; and for the year, 102,357.

### MEXICO.

ZACATECAS.

*Magistral.*—A new three compartment shaft is being put down at this copper mine. It has already reached a depth of 100 ft., and a small hoist for sinking purposes has been placed in position so as not to interfere with the work of putting up the big new permanent hoist which has been ordered. This company owns 140 pertenencias, or about 350 acres, along the strike of a well defined copper vein carrying cupriferous pyrites with some silver. The mine has been opened up to a depth of 550 ft. by means of a rather cramped shaft sunk on the incline, and the new shaft is being sunk for greater convenience and economy in working, the expense being justified by the showing in the older workings. The production is about 75 tons per day, most of the ore being reserved for future treatment in the 40-ton concentration mill, which is already completed. Water has to be brought from a mine called Purisima de Napoles, owned by the Magistral company, and the ditch for its conveyance is being cut as quickly as possible. The unusually wet season (which has seriously interfered with mining all over the Republic this year) has delayed this work very much, but it will soon be finished now. Rolls are used for crushing in the mill, and the motive power is furnished by a gasoline engine.

*Santa Rita.*—The new station pump at the 700-ft. level of this silver mine has just been put in place, and is working very well. The Santa Rita Mining Co. is an American concern, and the manager is E. McFarland. Since last July the shaft has been re-timbered from top to bottom, which is now down 800 ft. The new pump can throw 500 gal. per min., but the water which the mine 'makes' at present is only about 150 gal. per min. There is an old pump on the seventh level throwing 250 gal. per min., which is held in reserve. The vein carries heavy iron pyrites containing up to 40% sulphur. There is a small percentage of copper in the ore. The mine is producing from 5 to 10 tons of first-class the ton. This is being reserved for future smelting. The mine is provided with a 75-h.p. hoist good for a depth of 1,500 ft., and with a capacity of 200 tons per day from that depth. A complete equipment of cages, cars and track has been put in under the energetic management of Mr. McFarland, who has had to contend with difficulties of many kinds. The claims cover 300 acres, and there are several shafts on the property besides the main, Santa Rita.

*Cristo.*—A crosscut is being made from the Santa Rita to this shaft, the distance being 900 ft., of which 650 ft. have already been completed. The main Santa Rita vein has been opened up for a length of 1,400 ft., the average width of the ore-shoot being 18 in. The deposit is found in a true fissure, and is practically vertical. Second-class ore, assaying about 40 oz. silver per ton, is being taken out of the mine at the rate of 10 tons per day. The shaft will be sunk to 900 ft. within the next two months. Costs of working are at Nieves, the amount paid for breaking ground in drifts, 5 by 7 ft., and bringing the ore to the station being $2.50 gold per ft. Hoisting is comparatively expensive, but only amounts to about $0.50 gold per ton as an outside figure. Crosscuts are being made to veins which outcrop at the surface, but have never been worked.

### NEW CALEDONIA

Exports of minerals from the colony for the full year are reported by the *Bulletin des Commerce* of Noumea as follows, in metric tons:

| | 1903. | 1904. | Changes. |
|---|---|---|---|
| Nickel ore | 77,360 | 98,655 | I. 21,295 |
| Cobalt ore | 8,292 | 8,964 | I. 672 |
| Chrome ore | 21,437 | 42,197 | I. 20,760 |
| Copper ore | 10 | ..... | D. 10 |
| Lead ore | 6 | ..... | D. 6 |

The only exports direct to the United States were 17,194 tons of chrome ore.

Arrangements are being made to operate the coal deposits at Nondoue. The work is in charge of Charles Jacques, who represents a French syndicate.

### NEW ZEALAND.

The Mines Department reports that the exports of gold in January were 29,217 oz. in 1904 and 58,132 oz. in 1905, an increase of 28,915 oz. The bullion reported this year was equal to 55,285 oz. fine gold, or $1,142,750. The exports of silver for the month were 51,497 oz. in 1904 and 43,863 oz. in 1905, a decrease of 7,634 oz. this year.

### UNITED KINGDOM.

The discovery of an extensive tract of the Big Vein anthracite coal is reported from Glyn-Neath, South Wales.

A colliery at Tingley, belonging to the Yorkshire Coal & Iron Co., was recently the scene of an explosion which injured six men. It is considered probable that some gas had originated in the sump and exploded through coming in contact with open lamps carried by some workmen.

The New Moss Colliery Co., Ltd., Audenshaw, near Manchester, has decided to have a very large head gear erected at their pit by Goddard, Massey & Warner, Ltd., or Nottingham. The whole structure is to be made to the makers' lattice design of mild steel. The head gear has to be erected over the old existing one, and will not in any way interfere with the working of the colliery.

THE ENGINEERING AND MINING JOURNAL
MINING AND METALLURGY ESTABLISHED 1866

## Kansas Coal Mines.

The latest report of the State mine inspector of Kansas, Mr. James A. Orr, covers a period of six months only, Jan. 1 to June 30, 1904. The reason for this is that the fiscal year of the State has been changed from the calendar year to that ending June 30. During the six months the output of coal was 2,732,499 short tons, from mines in six counties. In the full year 1903, the production was 5,540,637 tons.

The total number of men employed in the mines during the half year was 10,347. This includes 376 convicts, who work in the State mine in Leavenworth county. The average number of days worked was 92 during the half year. The number of accidents reported is as follows:

| | Killed. | Injured. | Total. |
|---|---|---|---|
| No. of casualties ..... | 16 | 50 | 66 |
| Per 1,000 employees. .. | 1.546 | 4.832 | 6.378 |
| Per 1,000 days' work .. | 0.017 | 0.053 | 0.070 |

The list of deaths includes 9 miners, 5 shot-firers, 1 driver and 1 day man. The injured were 32 miners, 7 shot-firers, 6 drivers and 5 day men.

The State inspector, referring to the accidents, and to the report of the commission which recently investigated the causes of accidents in Kansas mines, recommends the enactment of the following laws:

1. Compelling all companies to drive three main entries parallel with each other, with no greater pillars between them than is necessary for the proper maintenance of the roof and the mine in general, and that all cross-entries be driven double; that is, two entries be driven parallel to each other, with no greater width of pillar between them than is necessary for the proper maintenance of the roof and the general good of the mine.

2. To prohibit any company or person from allowing any person to work in advance of 40 ft. from the last cross-cut or air-course, and to be punishable by a fine or imprisonment for such violation of said act.

3. That, when and where the mine inspector, after making a thorough inspection of a mine or portion of a mine, finds it unhealthful or unsafe for men to work therein, he be given the power to close such mine or portion of the same until it is, in his judgment, made helpful and safe for men to work therein. This would be an incentive for operators to keep their mines in the best possible condition at all times.

4. Compelling all companies to have escape shafts made and connected to the main shaft at not more than six months from the time the main shaft reaches the coal; and at no time should more than 10 men be allowed to enter the mine on any one shift until such escape shaft is completed.

5. Compelling all shots in the mine to be fired by electricity from the top of the mine.

6. Compelling all mine managers, superintendents, mine bosses, fire bosses, engineers and mine inspectors to pass an examination pertaining to the position they desire, before being permitted to hold such positions as specified above.

7. Compelling all men desiring employment in the mines to have at least two years' practical experience, along with some practical and experienced miner of at least five years in the mines, before given a place to work in alone and have charge of such place.

8. To redistrict the State of Kansas into four mine-inspector districts, with a mine inspector in each district, to have full power in such district to gather all statistics pertaining to his district and make report to the Governor, and have full authority in said district as to compelling the enforcement of the mining laws.

## Connellsville Coke Changes.

The H. C. Frick Coke Company, which is a subsidiary company of the United States Steel Corporation, has finally closed negotiations for the purchase of the coke properties of the Hecla Coke Company, of Pittsburg, located in the upper basin of the Connellsville region. This is a valuable independent operation, and its acquisition places the United States Steel Corporation in an almost impregnable position regarding its Connellsville coke supply. The property of the Hecla Coke Company consists of 1,500 acres of leased coal land owned by the William Thaw estate, and carries with it the privilege of adding to this leasehold from year to year. In addition to the coal property on which this coking operation is carried on, the Thaw estate owns 4,000 acres of land, which is entirely undeveloped and in the heart of the Connellsville region. There are three coke works, having a total of 1,072 ovens, and all improvements, such as power plants, homes for miners and coke workers and general supply stores, are included in the sale. The price paid for the property has not been announced, but it is reported that it is close to $3,000,000.

By the purchase of these ovens the H. C. Frick Coke Company owns and controls 75% of the coke production in the upper region and 65% of the entire Connellsville field. The upper region now contains 23,281 ovens, of which the Frick company owns outright 16,034, and it also secures 60% of the coke shipped from the ovens of the Oliver & Snyder Steel Company, the latter's three plants having 1,108 ovens, while it owns 50% of the capital of the Hostetter Connellsville Coke Company, of Pittsburg, operating 707 ovens, and secures half the output from the two Hostetter plants.

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The Nernst glower is 85% zirconia with 15% of yttria, ytterbia and related earths.

## German Iron Consumption.

The consumption of iron in Germany is estimated by the German Iron & Steel Union on a pig-iron basis. That is, in finding the totals, iron and steel finished products are reduced to the equivalent in pig iron, or to the pig iron consumed in making such products. The statement is as follows, for two years past:

| | 1903. | 1904. | Changes. |
|---|---|---|---|
| Pig iron production..... | 10,085,634 | 10,103,941 | I. 18,307 |
| Pig iron imports. | 265,422 | 288,726 | I. 23,304 |
| Pig iron equivalent of other imports ... | 208,891 | 252,903 | I. 44,012 |
| Total supplies | 10,559,947 | 10,645,570 | I. 85,623 |
| Pig iron exports. | 527,814 | 316,255 | D. 211,559 |
| Pig iron equivalents of other exports . | 4,269,464 | 3,628,056 | D. 641,408 |
| Total exports. | 4,797,278 | 3,944,311 | D. 852,977 |
| Consumption. | 5,762,669 | 6,701,259 | I. 938,590 |

The average production per head was 171.4 kg. of pig iron in 1903, and 169.2 kg. in 1904, a decrease of 2.2 kg. The average consumption was 97.9 kg. per head in 1903, and 112.2 kg. in 1904, an increase of 14.3 kg. In ten years the average production has increased from 105.1 to 169.2 kg., and the consumption from 71.9 to 112.2 kg. of pig iron per inhabitant.

## The Geological Survey in Nevada.

Topographers and geologists of the United States Geological Survey will be at work during the coming summer in the region south and east of Tonopah, Nevada. A party of 15 or 20 topographers under the direction of Mr. R. H. Chapman will go into the field about the middle of May. They will make surveys for three topographic maps. Two of these maps will be detail maps made by Mr. William Stranahan—one of the Goldfield district, which is 23½ miles southeast of Tonopah, and one of the Bullfrog district, which is about 60 miles east of Goldfield. The Goldfield map will cover approximately 40 square miles and will be drawn on a scale of 2,000 ft. to the inch. Triangulation and leveling will be carried from Owens Valley to get control for the Bullfrog map, which will also be drawn on a scale of 2,000 ft. to the inch. The third map will be a reconnaissance map of an area about 120 miles long by 90 miles wide, or about 10,000 square miles, south and southeast of Goldfield. It will include Goldfield in its northwest corner.

Geologic studies in these same Nevada areas will be prosecuted during the summer under the direction of Mr. J. E. Spurr. With the assistance of Mr. S. H. Ball, Mr. Spurr will investigate the general geology of the district covered by the reconnaissance map. Mr. Spurr will also make a special report on the geology of the mining camps in this area. A third report will have to do with the geology of the Goldfield district. Mr. Spurr will be assisted in this last inquiry by Mr. G. H. Garrey.

# The Michigan Smelter.

By R. T. White.

The works of the Michigan Smelting Company are situated near the south shore of Portage lake, about 2½ miles west of Houghton, Mich. The plant was erected to treat the 'mineral' produced from the mines owned and controlled by the Copper Range Consolidated Mining Company and the Mines of the Stanton group, together with material from other sources.

Lake Superior 'mineral' is the result of hand-sorting and mechanical concentration of the amygdaloid and conglomerate copper-bearing lodes. The sorting by hand yields two products—'mass,' varying from pieces the size of a man's head to several tons in weight, and 'barrel work,' which consists of smaller pieces, down to 10 or 15 pounds. The mill work results in 'headings,' almost clean copper, egg size, taken from the mortars of the steam-stamps, and from three to four 'grades,' varying in size and in tenor of copper from 35 to 90%. A fair illustration of the proportion, and copper content, of the various classes of 'mineral' is obtainable from the following table, showing the output of the Copper Range Consolidated Mines for four months:

| | Per-centage. | Dry Weight lb. | Copper % | Copper Contents lb. |
|---|---|---|---|---|
| Four grades.. | 67.2 | 11,786,672 | 68.72 | 8,101,796 |
| Headings..... | 15.1 | 2,659,846 | 90. | 2,393,861 |
| Barrel work.. | 6.2 | 1,089,140 | 68. | 740,615 |
| Mass..... | 11.5 | 2,016,105 | 68. | 1,370,951 |
| Total..... | 100.0 | 17,551,763 | 71.82 | 12,607,223 |

The dry 'mineral' consists essentially of 72% metallic copper and 28% gangue, the latter being, for the most part, self-fluxing.

The accompanying ground plan of the works will aid the description which follows: The wet 'mineral,' consisting of the 'headings' and the various 'grades,' is received in standard railroad cars on the track at the upper part of the works, where it is weighed in carload lots and shoveled or dumped into the receiving bins. These bins discharge into an A-9 Ruggles-Coles rotary dryer, whence the material is taken, in cars holding 20,000 lb., to the storage bins. The dryer, which has a capacity of 15 tons per hour, is fired with coal. The escaping gases pass through two Arlington & Curtis dust-collectors, and experience has shown that there is no loss of metal in this operation.

The storage bins consist of ten circular steel bins 30 ft. high by 12 ft. diam., each having a capacity of 250 tons. From these bins the 'mineral' is drawn into steel dump-cars (of 20,000 lb. capacity each) which are drawn by a standard Jeffreys electric locomotive, weighed, and then dumped into the charging hoppers over the melting furnaces. These furnaces are placed in the main building, which is constructed of steel and brick, and is 205 ft. long by 160 ft. wide. This building at present contains two melting furnaces (the hearths of which are 35 ft. long by 16 ft. wide) and two refining or casting furnaces (having hearths 23 ft. long and 14 ft. wide). The furnaces work in units, and there is space provided in the building for an additional unit when the supply of 'mineral' may require that extra capacity. The present furnaces have a combined capacity of 4,500 tons 'mineral' per month, or about 6,300,000 lb. refined copper.

The melting furnaces are charged every 24 hours with 60 to 80 tons of 'mineral' and 'barrel work,' the amount depending on the character of the material. As fast as slag accumulates in quantities of about 5,000 lb. it is skimmed into steel molds holding 1,000 lb. These are mounted on cars (five molds to a car) drawn by an electric locomotive. When the entire charge is melted, the slag is skimmed off fairly clean, and the copper tapped into the adjoining refining furnace. This furnace is placed about 7 ft. lower than the melting furnace, the two being connected by a steel launder lined with refractory material. Very little loss of heat is occasioned by this transfer. The copper is allowed to drain entirely out of the melting furnace, after which the side walls and bridge are fettled with silicious sand and the furnace is re-charged. Since the refining furnace does not require 24 hours in which to handle a charge of molten copper, it does its share of melting also, treating the 'mass,' 'barrel work,' discarded copper molds, scrap, etc., of which 20,000 to 30,000 lb. are charged into the furnace each day after it has been emptied of the preceding charge. The furnaces are so managed that this material is generally all melted by the time the charge of hot copper is ready to be tapped in from the melting furnace. After being filled, the refining furnace is brought to good heat and skimmed clear of slag. The copper at this stage is very coarse; the refining operation now begins.

Four ¾-in. pipes connected to the air-compressor, and supplying air at 90 lb. per sq. in., are put through the side doors into the molten copper. This produces an active agitation of the whole charge, and results in oxidizing the impurities contained in the copper, as well as some of the copper itself. The oxidizing process requires about two hours. It is continued until the metal is brought to the stage of 'set copper,' which is determined by a sample taken by the head refiner. This sample is taken in a small oval ladle, and when the copper has arrived at the proper state there is a characteristic depression of the surface of the 'button' in the ladle, and a single bubble will be seen at the apex of this depression when the sample is broken. At this stage the impurities have been largely converted into slag, and the copper contains, dissolved in it, about 6% of cuprous oxide. The furnace is brought up to good heat again, all of the copper that was thrown against the roof by the action of the air blast is melted down, and the surface of the bath is skimmed clean. Poles of hard wood, 18 to 24 ft. long, 6 to 8 in. diam. at the butt end, are now put into the furnace through the front door and forced down into the molten metal. The carbon reduces the cuprous oxide, bringing the copper to 'tough pitch,' which is again determined by the head refiner taking a sample. This should now have a flat surface. When the button is broken there will be no bubble, and the surface of a freshly broken sample will have a rose color and a silky luster. From 8 to 12 sticks of wood are used for the poling, which requires from 1½ to 2 hours. After the poling operation is well advanced, the surface of the charge is covered with charcoal, and is kept covered to prevent the oxidation of the copper until the charge is drawn.

The copper is cast into ingots, ingot bars or cakes of varying size, with a Walker casting machine. Copper molds are used exclusively. They are warmed with slag before being filled for the first time, and are sprayed with lampblack and benzine after each turn. Charges are poured at the rate of 30,000 to 45,000 lb. per hour, depending upon whether ingots or large cakes are to be made. At this writing single charges of 184,000 lb. have been handled, and it is intended to bring them up to 200,000 lb. To do this, the charges from two melting furnaces will be tapped into one refining furnace.

The pieces of refined copper are handled direct from the casting machine to industrial flat cars carrying 30,000 lb. (drawn by an electric locomotive) alongside the standard railroad cars, into which they are loaded for shipment to the consumer.

The gases from the melting and refining furnaces are led through a system of underground flues to the brick-lined steel stack, which is 15 ft. diam. by 122 ft. high. The underground flue acts as an efficient dust-collector; the stack base being at an elevation of 128 ft. above the furnace floor, ample draft is secured. The draught at the down-take of the melting furnaces measures 1.4 in. water. At the front door of the furnace it measures 0.34 inch.

The slag from the melting and refining furnaces amounts to about 35% of the total mineral received. A representative analysis of the melting-furnace slag is $SiO_2$ 40; FeO 16; CaO 11; $Al_2O_3$ 13; MgO 5; Cu 12 to 15. The refining furnace slag contains 30 to 35% copper.

An electric locomotive draws the slag-cars to the crushing plant. Here a pneumatic hoist is used to dump the pigs of slag into a 15 by 30-in. rock-breaker; the broken slag is discharged, by means of elevators and conveyors, into the blast-furnace bins.

The blast-furnace is a standard 38 by 120-in. water-jacketed cupola, and is placed in a brick building 32 ft. by 32 ft. The bins for slag, lime-rock, iron ore and fuel

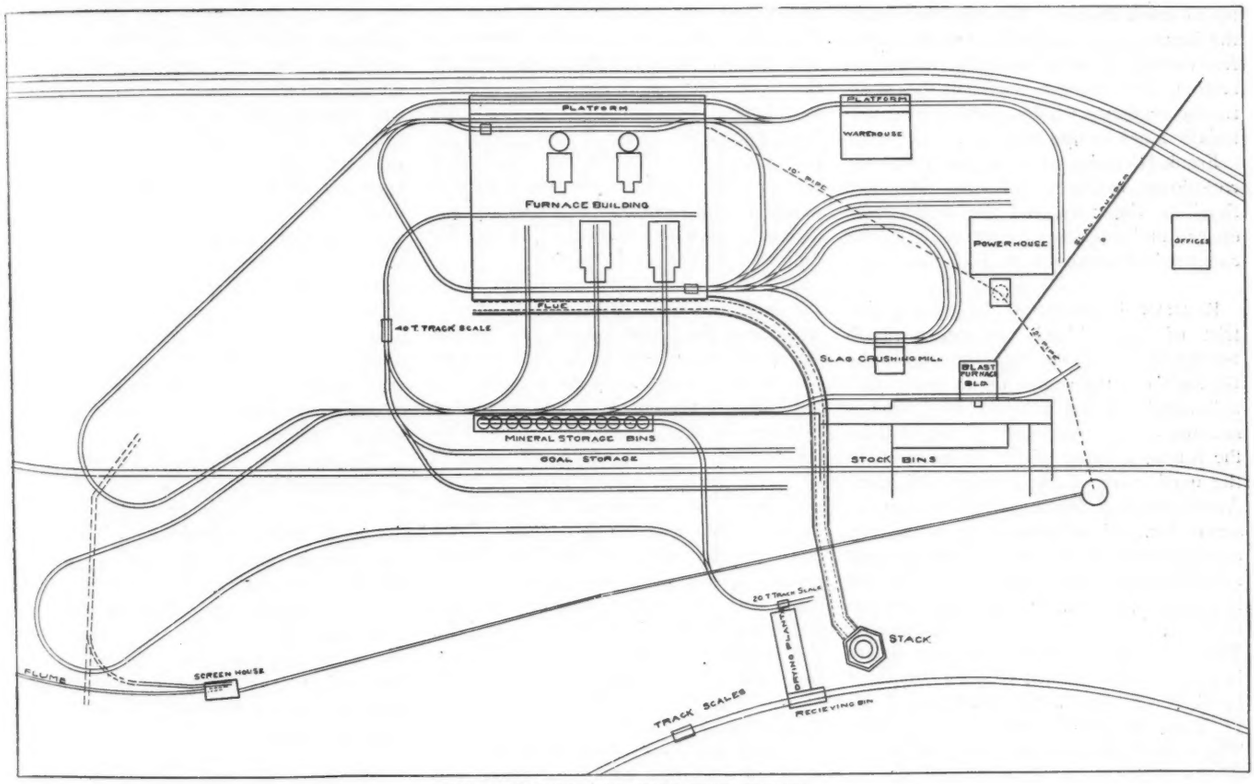
are conveniently situated at the rear of the furnace. Sufficient lime-rock and iron ore are added to the charge to produce a slag containing $SiO_2$ 40; FeO 20; CaO 16; $Al_2O_3$ 14%. The copper content of the blast-furnace slag averages 0.75%. The slag flows constantly from the furnace into a brick-lined steel settler, from whence it overflows into a launder, where it is granulated with water and washed off. The copper is tapped from the crucible of the furnace into rectangular molds holding 400 lb. These are called 'cupola blocks,' and are sent to the refining furnace. The fuel used in the blast-furnace amounts to 15.5% of the combined weight of the slag and fluxes. It consists of 1/5 coke and 4/5 anthracite. The latter is a better reducing agent and produces cleaner slag than coke.

The bituminous coal for the smelting and refining furnaces is received in railroad cars on the trestle behind the main storage bins, where ample space is provided for several months' supply. This is necessary in the Lake Superior region, as all supplies of coal are brought into the district by boat, and, for several months in the winter, water transportation is closed. From the storage the coal is taken by means of the industrial railroad to the hoppers at the various furnaces.

A brick building 50 ft. by 70 ft., conveniently situated, houses the power plant and machine shop. The former consists of one 12 by 23 by 36 in. Nordberg horizontal Corliss engine, belted to one 200-kw. General Electric alternating generator; one No. 7½ Root blower, with direct-connected vertical engine, for the blast-furnace; one 12 by 16 by 10 by 16 in. Sullivan air-compressor for oxidizing the charges of copper, for driving pneumatic tools, etc., together with condensers, feed-water heaters, etc. Exhaust steam is used for heating the office and other parts of the plant. Current is taken from the A. C. generator to drive a motor-generating set of 100-kw. capacity for supplying the electric locomotives and cranes. The machine shop contains a full complement of iron and wood-working tools, found useful in modern smelting plants. Stirling water-tube boilers are attached to the melting and refining furnaces, so that steam for power and heating purposes is generated from the waste heat passing off in the furnace gases. An auxiliary boiler is used for supplying steam when the furnaces are not in commission. The entire plant is served by the industrial railroad having 36-in. track gauge, and laid with 56-lb. rails. Three Jeffrey electric locomotives are used for handling the various cars.

The refining furnaces and casting machines are provided with crane spans having five-ton Shaw electric cranes; in fact, in the entire design and construction of the plant, an earnest endeavor has been made to replace manual labor with machines adapted to the specific purpose.

When the works were first started, the melting furnaces had a hearth area 50 ft. long by 18 ft. wide. Much difficulty was experienced in these furnaces, both with the fire-box roof and the sand bottom. The coal used, though having a high calorific value, is not what can be termed a long-flame coal. Its combustion produces a good heat for a distance of 35 ft. from the fire-box without any undue forcing; but, in trying to maintain a smelting temperature in the front portion of the 50-ft. furnace, the roof of the fire-box would last only from ten days to two weeks. The bottoms were made in the usual way with quartz sand, but the great expansion (and alternate contraction during cooling)




PLAN OF MICHIGAN SMELTING WORKS.

It was decided to reduce the size of the furnaces to 35 ft. long by 16 ft. wide, and the success of operating the smaller furnaces has amply justified the change. Furnaces of this size have a capacity of more than 70 tons of 'mineral' per 24 hours, and there has been absolutely no trouble or delay in their operation.

The experience with the 50-ft. furnaces demonstrated the great penetrating quality of hot copper, which in these furnaces found its way, not only entirely through the two ft. of sand bottom, but also far into

the foundation, illustrating the serious fact that, in furnaces of this type, great amounts of copper are continuously tied up in the furnace bottoms. In the construction of the new furnaces an effort was made to obviate this difficulty. The furnaces were built upon brick piers, covered with cast-iron plates, on which the bottom was laid. This was made of two courses of 12-in. silica fire-brick, laid as an inverted arch with 12-in. spring. Brick was decided upon for the bottom, not only on account of its making a stronger bottom, but also for the reason that, on account of the greater density of brick over sand, it would not absorb and thereby lock up so much copper. The construction of the furnace upon brick piers (which allows free circulation of air beneath, cooling the bottom, and thereby checking the penetrating tendency of the copper) also materially aided in this matter.

Frank Klepetko, of New York, was the consulting engineer for the Michigan Smelting Company, and the works were erected under the direct supervision of the company's superintendent, F. I. Cairns.

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RUSSIAN PLATINUM.—The mining district of Nijni Tagil (according to R. Spring in the *Zeitschrift* für praktische Geologie') is the source of no inconsiderable supply of this metal. The district is situated on the west slope of the Ural on the Kama, a feeder of the Volga river, in the north part of the province of Azan. An olivine rock decomposing into massive serpentine, and surrounded by pyroxenite, constitutes the chief massive. On the west are chlorite and talc schists. On the east is a diorite, called, by some Russian authorities, uralite-gabbro or epi-diorite. There is no doubt that the platinum occurs in massive olivine rock, as is substantiated by G. Rose, Van Cotta, Breithaupt, J. H. L. Vogt, Karpinsky and Krassnopolsky. The richest platinum placers which are in olivine rocks show no gold nor quartz; but as the washing departs from the rock gold and quartz both appear; this was also shown by G. Rose. The platinum was found microscopically in the olivine rock by Lacroix. No chromite was found in the washing, but a little of this appears in the microscopic examination of thin sections of the fresh rock. Chromite may be concentrated with the platinum. It is not yet shown that the milling of the massive rock for platinum would be profitable. The view that the olivine-gabbro is the mother rock is substantiated by the ready decomposability that its ingredients would show to the wearing of streams, while the diorite would resist this grinding action. Olivine or serpentine rocks seem invariably to accompany valuable platinum placers. Platinum then occurs in Russia in basic peridotites, while rocks rich only in feldspar give but little or none of the metal. In 1825 the placers of Nijni Tagil furnished crude platinum at 110 marks per kilogram; in 1878 the crude had advanced to 210 marks.

## Sieve and Screen Apertures.*

BY GEORGE T. HOLLOWAY.

It may seem unnecessary to point out[1] that a sieve of 30-mesh, for instance, does not possess an aperture of 1-30 of an inch, nor yield a product whose largest particles will be 1-30 of an inch in diameter, but the fact remains that most of those who employ the term 'mesh' have in their minds the idea that the particle is not far different from the figure shown by the fraction $\frac{1}{\text{mesh}}$

With coarse sieves, the error is not alarming and often unimportant. Coal screen and other coarse wire-cloth having four apertures or more to the linear inch are, indeed, already usually described by size of aperture. A ⅝-screen, for instance, would pass ⅝-in. particles, but would not have eight holes to every 5 in. With the finer sieves, however, the wire itself occupies so much space that the size of particle passed by the sieve may be anything from a quarter to about two-thirds of the size indicated by the word 'mesh.'

The largely increasing use of fine sieves for both full-sized plant and laboratory work, and the increasing area of the fine sieves which are now being used, or soon will be used, emphasizes the necessity for ordering wire screens, or describing results, in terms of size of aperture rather than number of mesh; because, in ordering by mesh, without stating gauge of wire, the user is in the hands of the manufacturer, who may supply a sieve of the finest possible wire, yielding particles of maximum size, or a strong lasting sieve, made with the stoutest suitable wire, and yielding particles of perhaps only half the size which the other sieve will pass. Similarly, a mere statement of the mesh of sieve used in practice is completely useless for purposes of comparison.

Taking the case of an 8-mesh sieve, made of 20-gauge wire, the wires will occupy 0.288 in., leaving only 0.712 in. for the space actually occupied by the eight holes, or 0.089 in. per hole. The apertures of the sieve will, therefore, be only 1-11 of an inch in diameter. The difference between mesh and aperture is enormously accentuated in the case of the fine sieves, especially when made of reasonably stout wire.

Those who are in the habit of using fine-mesh sieves are fully aware of the saving effected by the use of stout wire. A reference to Mr. Argall's table,[2] showing the size of aperture obtainable with sieves of different mesh with wire of different gauge, will assist in fixing upon the kind of sieve to use, and will also be a guide to manufacturers in deciding the type of sieve to stock and recommend for wear and general efficiency. In many cases, the tables show sieves of a certain mesh as capable of being made of stouter wire than is at present ever used; and to insure maximum wear, and to minimize the danger of lateral movement of the wires, and consequent enlargement of some of the apertures—a movement which cannot altogether be prevented—it is advisable to have sieves made of wire of the greatest possible thickness. For instance, a sieve to pass particles not exceeding 1-200th in. in diameter may be made of 70 mesh, with No. 33-gauge wire; 80 mesh, with No. 36; 90 with No. 37; 100 with No. 39; 110 with No. 41; or 120 with No. 43. The best sieve for such a purpose would be the 70-mesh, 33-gauge, which yields particles having a maximum diam. of 1-233 in., because it is the stoutest possible sieve for the purpose; and although the size of particles appears smaller than is required, the use of the sieve will soon result in the production of apertures of the required size and, ultimately, of decidedly larger spaces. The necessity for using pebbles or other coarse pieces on fine sieves, to prevent clogging in laboratory work, also causes rapid wear of the gauze, so that stout wire should always be selected. It must, however, be remembered that a sieve made with thick wire has a smaller number of holes per inch, and a correspondingly smaller output.

The lateral movement of the wires may be minimized by the use of 'twilled' wire-cloth, which results in greater stability of the mesh, but the enlargement of the aperture through wear of the wire is a constantly increasing factor, and, even under the best conditions and with new and carefully handled sieves, the actual maximum size of particle passed will always exceed that indicated by the table, although the bulk of the material may be within the required limits.

*Abstract of paper read before the Institution of Mining and Metallurgy, London.

[1] See THE ENGINEERING AND MINING JOURNAL, Vol. LXXVI, 1903, pp. 690, 843.

[2] THE ENGINEERING AND MINING JOURNAL, Vol. LXXVI, 1903, p. 681.

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Pure magnesite brick, when crystallized by the electric arc, according to E. K. Scott, does not run either at ordinary electric-furnace temperature, or at that of the alumino-thermic reaction.

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In the use of portable wireless installations, a continuous-current supply of about 100 watts may be obtained from a small dynamo driven by an ordinary bicycle-crank and sprocket-wheel. The dynamo may be mounted on a part of the bicycle frame.

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The activity which aluminum shows, when stimulated by mercury, is well known. It now appears, according to M. Tarugi, that the metal absorbs the vapor of mercury, and so readily that it furnishes a means of safe-guarding against poisoning by vapor of mercury. The air is passed through finely pulverized aluminum, and breathing can be carried on by a worker under conditions in which otherwise it would be dangerous or deadly.

## Air Power in the Quarry.—I.

By Lucius I. Wightman.

Compressed air as a mode of applying power is no novelty. Certain of its advantages have long been known and generally acknowledged. For instance, in mines and tunnels and in other confined places, where steam is prohibited by unendurable steam-pipes and stifling exhaust, air under pressure has been almost unanimously accepted, as the only agent meeting the arduous conditions of service. But even with these points of superiority, all its adherents know that these advantages are gained only at high expense. The rock-drill has never been regarded as an efficient air-engine; but it is known and loved for its tremendous faculty of 'getting there.' The air-driven hoisting engine was considered merely a necessary evil; it was tolerated because it seemed to be the only means of accomplishing certain ends, but it was disliked because of its voracious appetite for air. In cases where efficiency was less important than expediency, results alone counted.

It must be confessed by the pneumatic engineer of those earlier days that the charge of poor economy was not without foundation in fact. Be it further confessed that the average air-power plant will not weigh up well in the scale of efficiency, even in this era of economic refinement. In earlier times justifiable ignorance gave full explanation; but in the air plant of today nothing but the most inexcusable carelessness can account for low economy. Now, it is not fair to charge a system with defects which are due to poor engineering and bad management; it is the purpose of this paper to show that such charges, if not wholly unfounded, are at least unjustified as against the power system itself. Compressed air can be, and is being, used with a high degree of economy and widely diverse in fields. Today its usefulness is not limited to localities where nothing else can be used; on the contrary, it is holding its own in fair and open competition with other powers. Indeed, there are certain avenues of activity in which compressed air should properly have no competitor whatever; one of the most important of these is the modern stone quarry.

Time was when 'anything was good enough for the quarry,' as it had been for the mine. The main thing was to 'get out the rock.' Cost-keeping method was crude and the market was easy, and profits came in spite of carelessness. But in this day of competition the secret of success in stone quarrying hinges on reducing the cost of production to the lowest limit. The successful quarry organization of today is a huge machine adapted to secure maximum output at minimum cost.

Power is fundamental in every modern productive organism. Power costs often comprise a large factor of total productive costs. But more far-reaching in the method of production is the influence of a suitable power. This is true, whether the productive organism be a machine-shop or a quarry. Increased production may be desirable, even though the method which secures it may not reduce the power charge. But if the adoption of a new power system should result in an increase in production, together with a lowering of cost, in the hands of the aggressive manager, it becomes a two-edged sword entering a hotly contested field. In the paragraphs following it will be shown that compressed air does accomplish this. But as mere statements of possible economy, unsupported by indubitable fact, may awaken incredulity, I shall sketch briefly a conspicuous example of the central compressed-air quarry plant.

The Gray Cañon Quarry of the Cleveland Stone Company, at North Amherst, Ohio, is the largest sandstone quarry in the world. It is a chasm 165 ft. deep and more than a mile in circumference—a 'cañon,' indeed. It has been a stone producer for generations. Its output is wholly in dimension stone—a gray sandstone for building purposes and a fine-grained quality for grindstone stock. The equipment provides not only for the quarrying, but also for the cutting of stone to finished size.

For years the property was operated under the usual quarry method. Steam-driven mills, pumps and hoists were supplied from scattered boiler plants; channelers and drills drew their steam from a host of small portable boilers, and over all brooded the darkness of vapor and smoke. The introduction of steam marked a great advance over the old hand method, and the new system was hailed as the guardian spirit of the Gray Cañon. But the quarry grew, boundaries extended, depth increased. As conditions changed with growth, the shortcomings and the limitations of steam power became apparent.

The small-boiler plants were expensive steam generators; their appetite for coal was unreasonable. The distribution of fuel to the scattered boilers added cartage to the cost per ton; much was lost in transit, and in the continual moving of the portable plants. The result of these combined conditions was a fuel consumption, per pound of steam generated, that was startling. Added to this was the enormous steam consumption. It was impracticable, if not wholly impossible, to protect the steam lines, and pipe condensation was heavy. As the quarry grew and as pipe-lines lengthened, this condensation increased in a still greater ratio; it was found that the major portion of the steam generated never reached the engines. Inevitable results of this excessive condensation were a serious drop in pressure, and very wet steam; and these evils were exaggerated in engines which were not designed primarily for high economy. It was found that the machines, under the action of wet and sluggish steam, were doing only a fraction of the work expected. All these conditions combined to produce an appalling steam consumption which was rendered still more discouraging by the heavy fuel cost. To these measurable quantities were to be added certain less tangible losses, as the cost of labor applied in boiler attendance and repair, and in the maintenance of pipe-lines; the draining and thawing of pipes in cold weather; the labor and time consumed in moving portable plants; the shortening of the working day by the murky cloud in the quarry; the loss of time in starting at morning and noon; and, most subtle of all, the demoralizing effect of the smoke and steam on the temper and efficiency of the quarry workmen. These evils resulted in menacing the very existence of the Gray Cañon.

As a crisis seemed near, the management looked around for a remedy. After scanning every possibility, they finally entrusted the problem to the engineers of the Ingersoll-Sergeant Drill Company. Compressed air was decided upon. A strong advantage of the use of air power was that it could be applied effectively and cheaply to the quarry machinery already in use with steam. The old steam plant at the Gray Cañon included thirty-one isolated boilers (aggregating 1,200 boiler h.p.), many miles of small steam pipe, and a multitude of mill and shop engines, hoisting engines, channeling machines, drills and pumps. It was desirable, if not absolutely essential, to retain in service as much as possible of the old equipment. The plan contemplated a central air-compressing plant, a system of air-pipe distribution, and an application to machines already in use.

The power plant installed is centrally located and represents the highest attainment in steam and pneumatic practice. No point has been neglected which would contribute to plant economy. Steam is generated at 180-lb. pressure in four water-tube boilers, equipped with mechanical stokers and induced draft, and aggregating a trifle over 1,000 boiler h.p. As originally installed, for the Gray Cañon alone, only three of these boilers were in place; the fourth was added when extra load came upon the system. Feed and circulating pumps—in fact, all auxiliaries—are of standard types. Two air-compressing units are installed; they are steam-driven cross-compound-condensing two-stage Corliss machines, with positive air-thrown air valves. At a rate of speed of 90 r. p. m., with air at 100 lb. pressure and steam at 165 lb., each unit indicates about 1,000 h.p. and has a piston displacement of 6,030 cu. ft. of free air per minute. Compound steam-driven jet condensers handle the engine exhaust, drawing condensing water from an extensive system of cooling trays outside the power-house. Re-heating steam receivers, between high- and low-pressure

steam cylinders of the main units, receive also the exhaust from the condenser engines. Air cylinders are completely water-jacketed; inter-coolers and after-coolers are introduced at proper stages. The power plant in every detail is designed to secure minimum cost.

From the main primary receiver just outside the power-house a loop system of air-pipe distribution covers the entire workings of the Gray Cañon. Without going into detail, let it be said that this five-loop system secures great carrying capacity at low cost, avoids any measurable drop in pressure, gives the maximum discharge without drop on any branch, and permits the repair or alteration of any section without crippling or affecting the remainder of the system. It is a scheme of great flexibility. Frequent offsets properly care for expansion and contraction; proper supports relieve the lines from sagging strains. Ample provision is made, by tees and valves, for the attachment of new branches as the active zone shifts about. The work is so carefully laid out and adjusted that the loop system, as a whole, holds its working pressure for 12 hours.

As already stated, the plans called for the continued use, so far as possible, of the old appliances under the new system. The old machines were overhauled and connected; they took up the new burden without a murmur. At the outset, re-heating was not contemplated, and the plant was successfully operated for some months on cold air. But the possibilities of re-heating were too alluring; now re-heaters, simple, inexpensive, and 'home-made,' are employed at mill engines, hoists and pumps. At present about 300° F. is the temperature used, but this is not believed to be the limit. On the old steam channelers the boiler has been retained; a small fire on its partly covered grate makes it a combined receiver and re-heater; the cost of coke for re-heating is a mere bagatelle.

The bane of compressed air in expanding engines has been the freezing at exhaust ports. At the Gray Cañon plant this trouble was anticipated and provided for. A large part of the entrained moisture is condensed and collected in the inter-coolers and after-coolers; another portion finds lodgment in the primary receiver. From this point the lines grade to secondary receivers, where the condensation of the entire line is collected and removed through cocks. So perfect is this system for removing moisture that the plant was operated for weeks in freezing weather without re-heaters and with no freezing whatever.

The success of the compressed-air plant at the Gray Cañon was so remarkable that two neighboring quarries became interested. Their investigations led to an extension of the air system to the Malone and Mussey quarries, distant, respectively, about 2,000 and 2,200 ft. from the power plant. The only addition necessary at the power-house was the fourth boiler, already noted, and a second primary receiver from which the new pipe-line leads. A novelty was introduced, however, in this new main line and its two branches; instead of standard pipe, steel casing with Hammon joints was used; the cost of the line thus laid was found to be about two-thirds of that of a line of pipe of equivalent capacity. At the Malone and Mussey quarries the air power displaced boilers aggregating 600 boiler h.p., and is applied, as at the Gray Cañon, in mill engines, hoists, channelers, drills and pumps. It will be noted that the present equipment of four boilers, aggregating 1,028 boiler h.p., has replaced 49 isolated boilers, with a combined capacity of 1,800 boiler h.p.

The Gray Cañon plant has been chiefly sketched as an example of compressed-air power applied to quarry work. It remains to consider the results it has accomplished.

## New Course at Columbia University for Chemical Engineers.*

By Edmund H. Miller.

The training of technical chemists is a subject which has attracted the attention of both manufacturers and educators[1] for many years, and, judging by the numerous articles which have appeared and the diametrically opposite opinions which have been expressed, no apparent conclusion has been reached. In all probability it will be advantageous for this discussion to continue, as the curriculum of any institution is subject to improvement and alteration with changing conditions.

It is evident that there is a distinct demand for a kind of chemist who is not being produced; for a man who combines, with a solid knowledge of chemistry, considerable familiarity with both mechanical and electrical engineering; a man who is able to look at any proposition or process from the standpoint of the engineer as well as from that of the chemist; a man who can fill at first an analytical position, but who is, on account of his engineering knowledge, better fitted to become a superintendent than the man trained only in chemistry—in fact, a chemical engineer.

The demand for chemical engineers and the salient educational requirements have been given by Magnus Swenson,[2] and recently by J. B. F. Herreshoff.[3] The paper by the last named writer appeared in *Science* for April 8, 1904.

The present article deals with a definite plan for the education of chemical engineers, prepared after a careful consideration of the views of the chemists just mentioned. It has often been said, and with truth, that it is impossible to make a man both a chemist and an engineer in four years, when it takes four years to make him either. It must be admitted at once that a much better chemical engineer can be turned out in seven years than in four. We need no new courses for this; the student graduates as an electrical or mechanical engineer, and then, preferably after a couple of years of practical experience, returns to the university for the study of chemistry. Such a man has his engineering foundation; he finds the need of chemistry by his factory experience, and he brings to the study of chemistry a mature mind and an enlightened desire for knowledge. His work in chemistry should be emphatically a university course, leading, after the courses in analytical, inorganic, organic, physical and industrial chemistry, to research work and finally to the doctor's degree.

There is, however, a powerful and practical objection to such a course—the expense. The problem to be met at present is to approach this ideal as nearly as is possible in a four years' course. Such courses have been established at the University of Pennsylvania, at the Massachusetts Institute of Technology and elsewhere. The course at Columbia differs from these in many respects, the most important being that it is based on higher entrance requirements, viz., sixteen points by the examinations of the College Entrance Examination Board in the following subjects: algebra, geometry and plane trigonometry, chemistry and physics with laboratory work, freehand drawing, English literature, composition and grammar, American and English history, French and German. No time is devoted to these subjects after admission, so that the entire four years is given up to chemistry, engineering, metallurgy, mathematics, mechanics, physics and mineralogy. It is only by starting with such high entrance requirements (for the details see the pamphlet of the College Entrance Examination Board) that enough time can be found for the subjects essential to the chemical engineer; so the course to be given next fall at Columbia University contains more chemistry and more engineering than any four years' course so far proposed.

In order to get the greatest benefit from such a course the student should be, first, in good physical condition, and, second, well prepared. The preparation can be obtained in some of the best high schools; or, better, he should have a couple of years of college training, so that the culture studies, particularly English, shall not be neglected.

The first year of the four-year course in the School of Chemistry which has been established at Columbia University will go into effect in September, 1905. This course is based on the same entrance requirements as those in the School of Mines and School of Engineering, and leads to the degree of chemical engineer.

*Abstracted from a paper in the Columbia University 'School of Mines Quarterly,' April, 1904.

[1] W. A. Noyes, *Science*, March 7, 1902; Lachman, *Science*, May 16, 1902.

[2] *Bulletin* of the University of Wisconsin, June, 1900.

[3] *Trans.* the New York Section of the American Chemical Society, February 5, 1904.

## A Lost Orebody.

By Harold J. Read.

The condition of the mine at the time it was abandoned by the original owners is shown in Fig. 1. They had followed the vein down between walls of gray limestone to a depth of 650 ft., where the contact between diorite and limestone was encountered. However, this condition had nothing to do with the regular course of the vein, and they continued to extract the same rich ore to the 900-ft. level. It is estimated that the production of the mine to this point aggregated $7,000,000. At the 900-ft. level an unexpected condition confronted them. They were at an entire loss as to what to do to re-discover the vein. They ran thousands of feet on the fault; owing to particles of ore ('the drag') within the fault, they decided to sink. Conditions seemed to warrant the conclusion that the vein had taken a directly reverse dip at the 900-ft. level. As nothing was encountered in the shaft, a raise was made, as shown in Fig. 1, but still on the near side of the fault. They then started to cross-cut and raise on the further side, but in this work they fared as badly as in their other endeavors to find the vein.

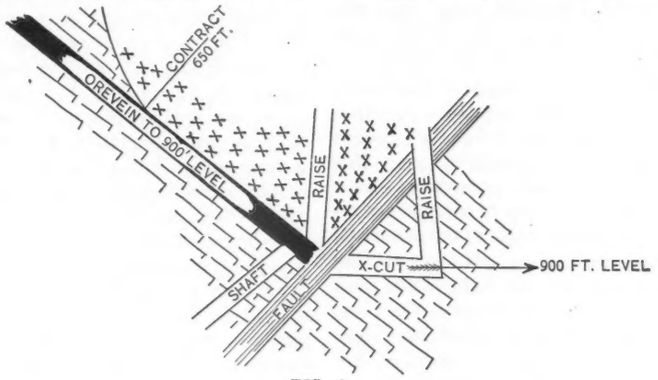


FIG. 1.

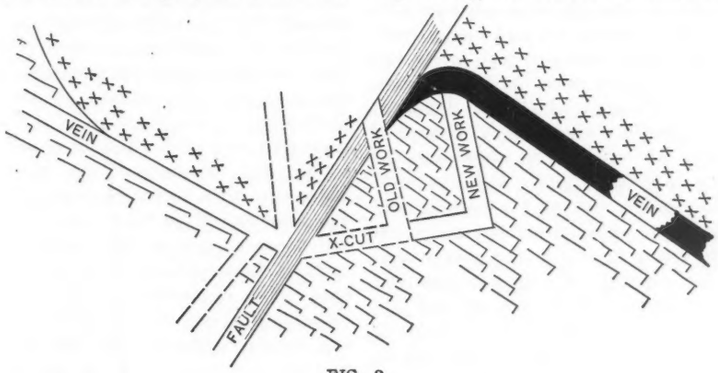


FIG. 2.

Later explorations encountered a series of faults, causing similar breaks in the vein. These are illustrated in Fig. 3.

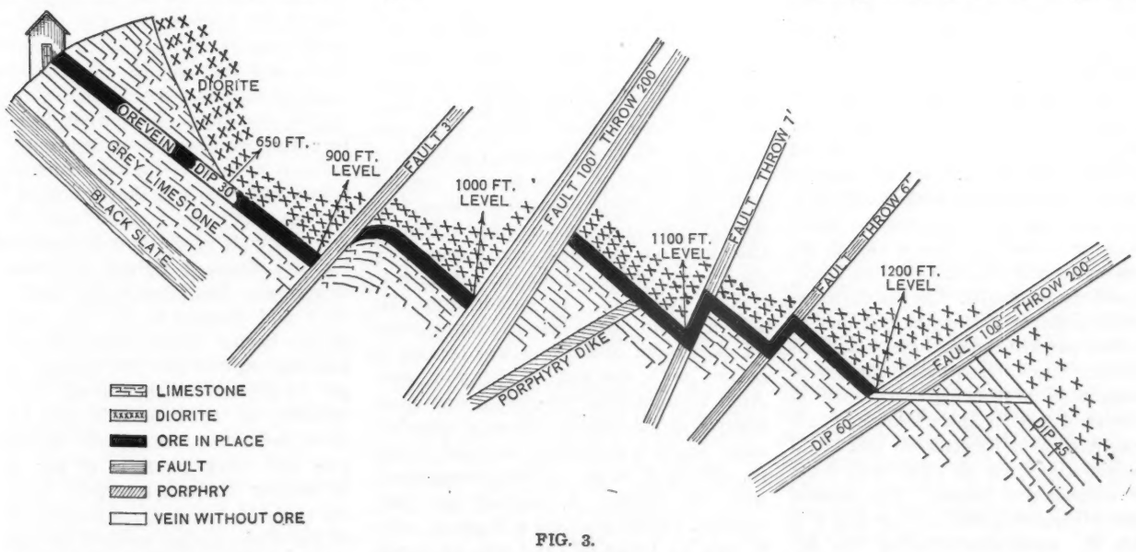


FIG. 3.

Owing to these circumstances, the mine was permanently abandoned by the original owners in 1889. In 1900, Mr. I. E. Rockwell, of Chicago, became interested in the property. He decided to unwater the old workings after an idleness of twelve years and see what could be done in the matter of re-discovering the lost bonanza. The undertaking proved costly. However, after this part of the work had been accomplished and the mine had received a thorough study, he decided to continue the cross-cut at the 900-ft. level away from the fault; then a raise was made, which again encountered the vein and ore, as shown in Fig. 2.

## The Development of Machinery.

There never was a machine so perfect that some one could not produce a better. The limit to improvement, though theoretically possible, is never attained. From the wooden spade to the steam shovel extends a long line, strewn with various devices for overturning the soil. No one can be sure that the progress of another century may not make the puffing, jangling steam shovel that is now the pride of our engineers seem as primitive as the wooden spade of our ancestors looks to us today.

The magnificent pumps with which we now unwater our mines, and which at the present moment represent the limit of man's ingenuity in this particular, may be but the forerunners of mechanism that will consign these to oblivion. Who will say, even, that a single one of our processes for wresting from Nature her buried treasures, from the initial survey of the prospector to the last step in ore-separation, is not capable of such vast improvement as will, in another generation or so, make the present processes merely matter of interesting history?

During recent years the improvements in mechanism have been so numerous that many large companies seem to have been kept comparatively poor by the purchase

of machinery that goes to the scrap-heap long before it is worn out. The loss is only a seeming one, however, as witness the wonderful growths in steel manufacture, brought about largely by those who were not afraid to throw away costly machinery as soon as it was demonstrated that something better was obtainable.

While patents on improved machinery are frequently issued to miners, metallurgists and mill-men, yet few of such designs find their way into commercial use. The improvements actually introduced come from the drafting rooms of machine manufacturers, where the wants of the miner and the smelter are studied, and ideas worked out systematically in the light of the most recent knowledge and practice. In these days of high machine development, technical training is required to make real improvements, and the man with the 'happy thought,' who flies to patent it, usually finds that the idea has been discounted by machine designers, and is in some way impracticable.

An example of this kind of an inventor is the man who, the other day, obtained a patent for a process by which he was enabled to make razors from copper. It apparently never occurred to him that while copper for this purpose would cost at least 15c. a pound, most manufacturers would conclude that steel at ruling prices would still be sufficient for their needs, as of old. Such inventors, really, are not far removed from the class in which belongs the man who, as reported, was recently seeking for capital to float a scheme he had thought of for making cuspidors out of spitzkasten!

But if the trained machine designer, working for a corporation, is crowding out the old-time inventor, it is by right of the survival of the fittest. Just as the geologist has proved his right to a forward position in the mining world, because his scientific training enabled him at times to go a step in advance of the man who studied mining with a pick, so the educated mechanical engineer has taken precedence of the inventor, the machinist and the miner.

Machines are designed on paper, by drawings, at first more or less crude and fragmentary, but gradually taking shape as the various problems are worked out. Mechanical drawing is a language by which the designer makes his ideas known to the pattern-maker, the iron-founder, the blacksmith and the machinist. On the drawing-board the engineer studies the relations of the various parts of the machine, and eliminates superfluities. It is vastly cheaper to experiment on a drawing-board than in iron and steel; and the more knowledge the designer has, the more certainly will he do all the experimenting on paper before the actual construction begins. The science has now advanced to such a stage that it is possible for men understanding the demands in a certain line of machinery to produce merely from the drawings a first machine that will be operative.

## Diamond Drilling Under Difficulty.*

By S. C. Thomson.

In 1899, when the Vogestruis Deep stopped sinking the west shaft, the formation at the bottom indicated the close proximity of the South Reef, and in May last the board of directors authorized sinking a bore-hole to locate the reef. In deciding not to unwater the shaft but to locate the drill on the surface and carry the rods down through the 5-in. air column, it was supposed that the air column extended to within 40 to 50 ft. of the bottom of the shaft, and had it been known, as subsequently found out, that this distance was 95 ft., it is doubtful if the work would have been attempted, as it is apparent that 95 ft. is a long distance for a 4-in. pipe to stand vertically without support except at the top and bottom. The plan decided upon for carrying out the work was as follows: To put 260 ft. of 4-in. pipe down through the air column to the bottom of the shaft, to act as a continuous support for the drill rods; secondly, to lower 2½-in. pipe with steel collar set with diamonds, to rotate this and drill a sufficient distance to seat this pipe firmly and make a permanent guide for the drill rods.

The first thing that had to be done was to cut through a fitting at the bottom of the 5-in. air column to allow for the passage of the 4-in. pipe. A 4¾-in. rose-bit was slowly sent to the bottom, but, meeting with some resistance, it was necessary to rotate it, and in this way a considerable quantity of iron shavings and scale accumulated at the bottom, and prevented this solid rose-bit from reaching the fitting. A 2-in. star-bit was substituted, and, after boring through the fitting and allowing the débris to pass through, the rose-bit successfully removed the obstruction. A 4-in. extension pipe (strengthened at the lower end with 40 ft. of boiler tubing, all the couplings being turned in the lathe to 4⅝ in. diameter outside) was then lowered, the approximate weight being 6½ tons. The 4-in. pipe was freed from the drill rods by means of a left-hand threaded socket. A 2-in. chopping-bit, which was then lowered, was found to turn very hard near the bottom, and the drill rods on being brought to the surface were found to be badly bent, indicating that the 4-in. pipe had been deflected by the uneven surface of the rock at the bottom of the shaft. In withdrawing this 4-in. pipe two of the bottom lengths broke off on account of the couplings coming in contact with the end of the 5-in. pipe. After straightening the pipe, it was again lowered to the bottom, but as it again became bent it was reduced in length to 223 ft., and 109 ft. of the end was strengthened with 4-in. tubing. A chisel-bit was then lowered. After reaching a depth of 2,510 ft. this bit broke off, and was recovered with a 2½-in. tap. It was estimated that there was still a deflection of 10° in the last 100 ft. of rods. However, it was decided to lower 400 ft. of 2½-in. pipe through the 5-in. and 4-in., and make a trial drill with 'B' drill rods. This 400 ft. of 2½-in. pipe had a bell-mouth fitting at the top to act as a guide for the drill rods, and was lowered with a left-hand plug to prevent the rods from unscrewing when leaving it. After several attempts to seat the 2½-in. pipe by the use of a chopping-bit, the rods broke, leaving the bit and 10 ft. of drill rods at the bottom. It was then decided that the angle of deflection was too great to permit of drilling, and the 2½-in. pipe was brought to the surface, leaving the chopping-bit and 10 ft. of rods inside the 4-in. pipe. Several attempts were made to raise the 4-in. pipe for the purpose of straightening it, but the deflection was too great to allow it to be pulled through the 5-in. pipe. At this point the only course open was to blast off the bent portion of the pipe, with the hope that the remainder of the pipe would slide through the 5-in. pipe and reach the bottom of the shaft in a vertical position. After several experiments it was found that a charge of dynamite could not be fired with an electric battery, owing to short-circuiting of the insulated wire due to the high pressure of the water. A water-tight torpedo was then made out of gas pipe capped at both ends. Experiments proved that in this confined space 12 ft. of fuse exploded a cap in 4½ minutes, and an equal length of the same fuse tested in the open air exploded the cap in 6½ minutes. The torpedo with which it was intended to blast off the 4-in. pipe in 2,500 ft. of water was made of a 7-ft. length of 2-in. standard pipe, with 9 in. of 1½-in. pipe on the top end, a suitable size for the recovering tap. The intention was that the torpedo should be stopped by the top of the broken drill rod, the end of which was 10 ft. from the bottom of the shaft, and the charge, consisting of 21 sticks of gelatine, would break 17 to 20 ft. of the bent pipe. Two 20-ft. lengths of fuse were used, with insulated copper wire between to prevent the coil from burning across and making a short circuit. When all was ready the torpedo was put in a vise, the ends of the fuse lighted, and the top cap screwed tightly on. The destroyer was then taken to the head of the shaft and dropped in the 5-in. pipe, one minute having elapsed from the time the fuse was lighted until the torpedo was let go. In 3½ minutes the torpedo was heard to strike the top of the 4-in. pipe 2,317 ft. from the surface, the velocity through the 5-in. pipe being about 11 ft. per second. In another minute the torpedo struck the top of the broken drill rod near the bottom of the shaft, having traveled through the 119 ft., the lower portion of which was lined with boiler tubing having an internal diameter of 3.17 in., at the rate of 3.16 ft.

*Abstracted from a paper entitled 'Diamond-Drilling from the Bottom of a 2,500-ft. Shaft, Full of Water,' read by S. C. Thomson before the South African Association of Engineers.

per second. Just 36 seconds after having reached the broken rod the explosion took place, the time which had elapsed from the time of lighting the fuse to the time of the explosion being 6 minutes and 6 seconds. According to the previous experiments with one fuse enclosed in a pipe, 7½ minutes should have elapsed, but it is possible the fuses burned more rapidly due to the heat generated by two fuses burning in the same pipe.

The following day the 'B' drill rods were lowered with 20 ft. of 2½-in. pipe, having a 3½-in. chisel-bit on the lower end, which rotated within 4 ft. of the bottom of the shaft. It was surmised that the bit was working on iron, and when brought to the surface, as there was no bend in the pipe, the indications were that the 4-in. pipe had reached the bottom in practically a vertical position. A recovering tap was then lowered, and brought up the piece of 1½-in. pipe which had been placed at the top end of the torpedo. A diamond-bit, 2 15/16 in. in diameter, was lowered, and, after considerable difficulty, succeeded in making a start through the loose material at the bottom of the shaft, boring a sufficient distance to make a seating for the 2½-in. pipe, which it was intended should serve as a permanent guide for the drill rods in subsequent drilling. The 2½-in. pipe, which was tapered to 2⅛ in. at the lower end so as to enter the hole, was then lowered, and, after considerable trouble, was fixed in the hole prepared for it. After this 2½-in. pipe had been properly seated no further difficulty was experienced, and in 60 days 428 ft. of drilling was accomplished, making a total depth of 2,948 feet.

The drill used in this work was a Sullivan 'B' machine. The time required for hoisting and lowering the rods, taking out the core and putting on new bits was 4½ hours. The novelty of this drilling operation was in starting the drilling at the bottom of a shaft 2,525 ft., full of water, with no fixed guide for the drill rods in the last 95 ft. to the bottom to hold them laterally, and the difficulty of the work was to obtain a seating for the external guide pipe.

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The yttria for the Nernst lamps comes from Norway, Sweden, and Llano county, Texas, the latter furnishing the best variety, which for this purpose means yttria earths of relatively high combining weights.

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According to recent work by A. Sauveur and J. Whiting, with mean and high-carbon steel, the transition, from the unmagnetic to the magnetic condition, occurs at the point of recalescence. This is the temperature at which the hard iron changes to the soft variety, the change in the dark being accompanied with a momentary glow. The detection of the point of manifestation of magnetic property can therefore serve as a guide in regulating the temperature of rail rolling.

## Deterioration of Mine-Car Couplings.*

By Walter H. Finley.

While connected with the New Soddy Coal Company, at Soddy, Tenn., the writer had his attention called to a very practical demonstration of the fatigue of metals by crystallization. This company's mines are situated near the head of the gorge formed by Little Soddy creek. Necessarily the track connecting the mines with the Cincinnati Southern railroad must follow, to some extent, the sinuosities of that very restless stream. The result is an incline 7,200 ft. long, with 210° of curvature and a difference in elevation of 450 ft. To make the situation even more difficult, the heaviest grade is all above the center, while the approach of the tipple for a long distance is only 2.5%. As this is a modification of the reciprocating gravity incline, the loads, consisting of a trip of 36 one-ton mine cars, will be on the steepest part of the hill, while the empty trip at the other end of the rope is on the flats below, offering very little resistance to assist the brakes in holding the loaded trip. Then, again, when the loads are starting on their run over the 2.5% grade to the tipple, needing every particle of momentum to make a landing, the empty trip is on the steep hill most effectually holding them back. In spite of these difficulties, the installation was a marked success, handling over 1,000 tons in 9½ hours at a very low cost.

An engine was attached to the incline drum; and when the drag of the empty trip was about to make itself shown in the speed of the loads, a friction clutch gave the engine the burden of the empties, leaving the loads free to make an easy landing.

About 1,000 ft. from the top is a 14% grade on a 16° curve. As the trip of 36 cars represents a gross weight of 55 tons and a tension on the rope of 8.25 tons, it is evident that the brake on the drum must be very powerful. In fact, the energy to be absorbed by the brake was more than the brake blocks could stand, and an 8 by 4-ft. fan was geared to the drum shaft to assist the brake. This entirely remedied the trouble, as the fan held the trip under control till it reached the parting at the center, where it was thrown out of gear. In such a long trip the stress in the drawbars and hitchings near the back end is almost as great as that in the rope; consequently these parts are made very heavy.

About a year after this incline was put in, the loaded trip parted on the hill, with the result that possibly half of the 36 cars could be used again without having to be entirely re-built. The coupling that parted was found without a pin, which in mine hitchings is not removable from the clevis without breaking. The wreck, therefore, must have been caused by the breaking of this 1⅛-in. pin, though it and the balance of the hitching was made by William Harris & Son, of Pittsburg, who use the highest-grade iron.

Not more than two weeks later an accident happened again in identically the same way. The writer was fortunate enough this time, however, to find a piece of the broken pin, which showed, instead of the dark, velvety appearance one would expect, a bright, crystalline fracture, like burned steel. Following this clew, several hitchings were laid on an anvil and the pin broken by a single blow from a sledge. Pieces of the broken pins were then heated to a bright red, and, after cooling slowly, were again put under the hammer, which failed entirely to break them. After cutting with a cleaver, the pins were broken, and the fracture showed a complete restoration of the fibrous structure.

This annealing process was then applied to the whole supply of hitchings. Piles of 25 or 30 were covered by a hot wood fire, which was allowed to die down and go out, leaving the hitchings in a bed of ashes to cool off slowly. By repeating this every six months the danger from brittle pins was entirely avoided.

Looking at the circumstance from the present standpoint, it is reasonable to expect crystallization in a mine hitching, as it is subject to many shocks and jars, both while on the car and in the hands of the coupler. Then, too, in winter the sudden change in temperature from the mine at 65° at the outside to 10° and lower, repeated 20 times a day, must assist in this deterioration.

The object of this article is to cite a possibly new application of this well-known physical fact; but if it calls the attention of some one to impending danger and thereby saves the expense and annoyance of an accident, it will have more than accomplished its purpose.

*Abstract of paper read before the Engineering Association of the South, March 20, 1905.

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The monster blast-furnace at Anaconda, according to the local press, is 51 ft. by 56 in., in the clear. It has 88 tuyeres, and at the start treated 1,700 tons per 24 hours, though it is expected that it will run considerably above this, as the men and furnaces get used to each other and to the charge.

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Regarding the recent change of color of that part of the planet Mars called *Mare Erythraeum*, Prof. W. H. Pickering, of Harvard, says that such changes are not uncommon. The region in question, though called a sea, is in a vegetation area, and the change was from blue-green to chocolate-brown. Erythraeum is in the southern hemisphere of Mars, and it is relatively February there. This is the first time that it has been visible for a month, Mars being now in perigee. The winter on Mars has apparently been a mild one, for the Martian arctic and antarctic regions have not shown their usual snow this year.

# Milling Practice at the Camp Bird.

By Stephen L. Goodale.

The Camp Bird mine at Ouray, Colorado, produces a highly silicious free-milling ore. This is transported from mine to mill, on a Bleichert aerial tramway, two miles long. In brief, the ore is treated as follows: After preliminary breaking by Hake crushers, it is pulverized by stamps, passes over 16-ft. copper amalgamating plates, and thence through mercury traps to 6-ft. vanners. After concentration the sand is classified by spitzkasten; the coarse is elevated to be re-ground by these being elevated and fed to four 5-ft. Huntington mills. This feed is through a cone with overflow to provide for excess material, any coarse sand that escapes being returned to the mills. On the battery a 26-mesh 29-wire screen, and on the Huntington a 30 or 35-mesh 29-wire screen, is employed. Latrobe soft-steel tires and bull-rings are in use. For a time the mills were speeded from 70 to 82 rev. per min. The result was to decrease greatly the wear and tear, without securing a correspondingly increased duty; the speed has now been reduced to 75 rev. per min. The following grading tests throw light on the grinding accomplished:

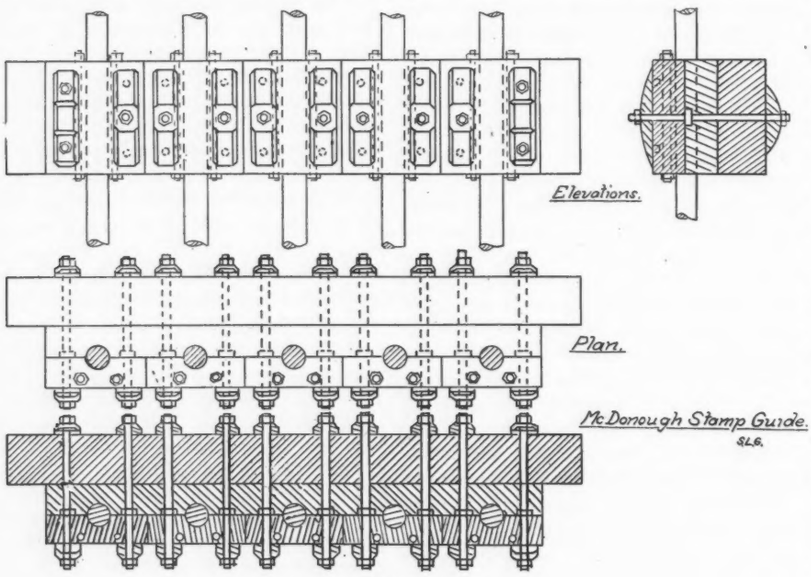


FIG. 1.

Huntington mills; the middling and fine, and the product of the Huntingtons, are passed over a second set of vanners; the tailing from these flows direct to the cyanide annex.

In the new battery 10 stamps were installed during the past summer, bringing the total to 70; these stamps, equipped with new iron, weigh 1,050 lb. The mortar rests on a 7-ton anvil block, a ¼-in. gasket insuring even contact; the anvil block is set on a 3½ by 5-ft. concrete bed, built 3 ft. to bedrock. The stamps drop 8 in., 100 times per minute; the height of discharge is about 3 inches. All material fed to the stamps will pass a 1½-in. ring; the average duty is 3.9 tons per stamp per 24 hours, as against 3.4 tons for 850-lb. stamps where wooden mortar-blocks are employed. The MacDonough individual guide (see Fig. 1) is now used for all stamps, and is extremely satisfactory in service. Apron plates are 53 in. wide by 16 ft. long, without riffles, and sit at an inclination of 1⅝ in. per foot.

The re-grinding of the coarse sand from the battery was adopted early in 1903, and has resulted in raising the total extraction by 3%. The necessary classification is accomplished by spitzkasten after the first concentration, the coarse discharge from

| Remained | Sand fed to Huntington mills. % | Discharge from same. % |
|---|---|---|
| on 40-mesh screen | 13.0 | 0.4 |
| " 50 " " | 28.2 | 4.4 |
| " 60 " " | 16.3 | 8.5 |
| " 80 " " | 9.7 | 11.5 |
| " 109 " " | 13.2 | 18.6 |
| " 120 " " | 7.2 | 14.4 |
| " 150 " " | 4.7 | 8.8 |
| " 200 " " | 2.9 | 9.1 |
| Passed 200-mesh " | 4.4 | 24.0 |

The concentration equipment consists of 35 6-ft. Frue vanners and 5 Wilfley tables; 21 vanners and 2 Wilfleys receive the tailing from the battery plates; 14 vanners and 3 Wilfleys take the middling and fine from the spitzkasten, and the re-ground material from the Huntingtons. The machines on the coarse side run at 190 rev. per min., and are given an inclination of 3½ to 5 in., their entire length. On the slime side, a speed of 180 rev. per min. is allowed, with an inclination of 2½ in. The first row of vanners is equipped with copper plates, which are fitted to the pulp distributors. The vanners are anchored to massive sills which run the entire length of the building. This makes the tables rigid—an important point, because a little lost motion will result in poor separation.

Two automatic samplers are used, one for the pulp delivered to the cyanide mill and one for the slime overflowing from the spitzkasten and slime-gates on the vats, and also for that running to waste. The accompanying cut (Fig. 2) illustrates this sampler. It is operated by a small stream of water, which can be regulated so as to control the sampling interval. Water is delivered at one end of the box, *B*, until the float is raised and the catch released, when the unbalanced weight of water throws the sampler to its opposite position; the scoop at the end of a long arm passing across the stream intercepts a small sample and throws it through a split into a tub below. The water runs from the box as soon as the sampler is thrown, and the opposite end of the box is then ready to fill. The jar of the throw is lessened by the air-buffer shown. The scoop is made of two sheets of thin iron riveted to ½-in. square iron rod, bent as shown. It is adjustable to deliver the sample higher or lower, as desired.

After sampling, the pulp is elevated to the top of the mill for distribution to leaching vats by gravity. For this purpose, two bucket-elevators are employed, a third being always in reserve. A 15-in. rubber belt is used, traveling 430 ft. per minute; the buckets are 14 in. long by 8 in. wide and 6 in. deep, and are bolted 20 in. apart on the belt. In case of a shut-down, the pulp from the stamp-mill must be temporarily turned to waste; this is accomplished automatically by gates in the launder leading from the sampler to elevator boots. These gates are hung on long cords passing over pulleys at the elevator heads to a perforated bucket counterweight hanging in the discharge-stream from the elevators. As long as the elevator runs, these buckets are kept filled and hold the gates up out of the launder; whenever the elevator stops, the bucket drains quickly, the gates drop, and the pulp is backed up until it overflows to waste.

A five-compartment spitzkasten removes a large amount of the slime, and the sand is run through distributing launders to the upper vats, as required. Butters & Mein distributors fill the vats, the unevenness being leveled off by hand. On a 22-ft. vat there are two, on a 30-ft. vat there are three, and on a 40-ft. vat there are four slime-gates. An old form of slime-gate, which jutted into the vat, took away a little leachable sand with the slime every time the longest distributor arms passed; to avoid this loss a new gate, built outside the vat, is now in use on the newer vats. The slime overflows through short 3-in. nipples into a box the height of the vat, about 10 in. by 10 in. inside; one side of this consists of a series of gates easily removable to permit access to the interior of the box so as to cap the successive nipples as the vat fills with sand (Fig. 3). The following grading tests show the re-

sults of the classification: (A) is stamp-mill tailing; (B) is sand from (A) settled in leaching gates; (C) is slime overflow from spitzkasten and slime gates.

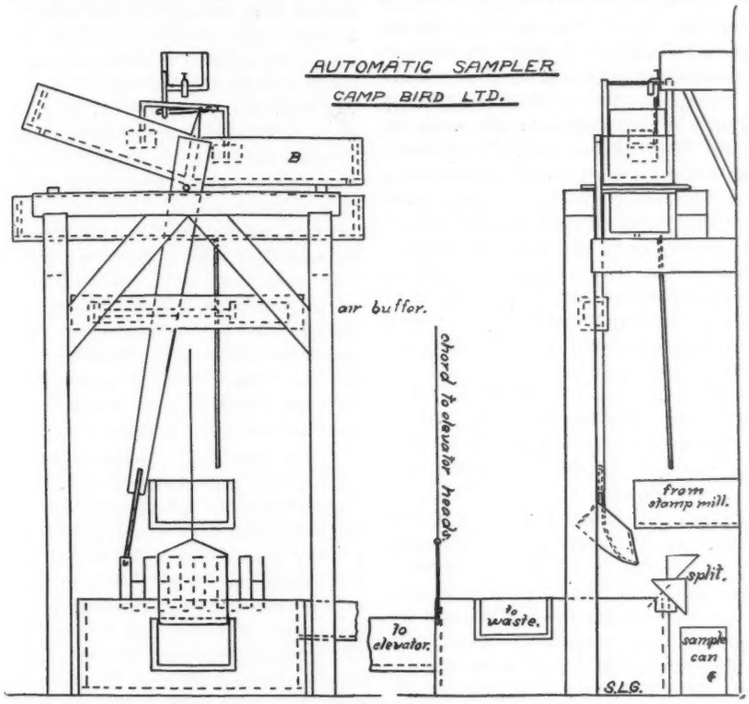


FIG. 2.

| | (A) % | (B) % | (C) % |
|---|---|---|---|
| Remained on 40-mesh screen | 0.5 | 1.4 | .... |
| " 50 " " | 3.7 | 6.5 | .... |
| " 60 " " | 6.5 | 9.6 | 0.09 |
| " 80 " " | 7.7 | 10.9 | 0.17 |
| " 100 " " | 9.9 | 15.2 | 0.16 |
| " 120 " " | 12.7 | 17.3 | 0.25 |
| " 150 " " | 6.5 | 8.1 | 0.16 |
| " 200 " " | 8.4 | 11.9 | 1.17 |
| Passed 200-mesh " | 42.6 | 18.4 | 98.00 |

(B) gives excellent results in leaching, little trouble indeed being experienced until the slime reaches about 30 per cent.

All sand is now subjected to double cyanidation, and is held under treatment as long as the capacity of the plant will allow—that is, until any vat in its turn is required to receive the stamp-mill tailing. Following is a condensed record which may be taken as the present average treatment: Charge, 300 tons; time, from application of the first solution to sampling the exhausted sand before sluicing it, 469 hours; extraction of gold, 78%; lime used, 735 lb.; protective alkalinity of 0.1% KCy solution kept equal to 1, or 1.5 lb. NaOH per ton; protective alkalinity of 0.25% solution kept equal to about 1.5 lb. NaOH per ton. Solutions applied: 84 tons of 0.1% KCy solution; 282 tons of 0.25% KCy solution. Sand shoveled from upper to lower vat: Time in upper vat, 207 hours; 244 tons of 0.25% KCy solution; weak solution from various upper vats of diminishing strength for about 70 to 80 hours; final wash, 140 tons of water.

The metal is recovered from the solutions in 6- and 7-compartment extractor-boxes. The slime is cleaned out once per month, treated with hydrochloric and sulphuric acids, washed thoroughly, dried and smelted in the following proportions: Slime, 40 lb.; flux, 20 lb.; the flux consists of 40 lb. sodium bi-carbonate, 90 lb. powdered borax, 15 lb. hematite, and 10 lb. silica. As the cyanide-mill bullion is too low grade to ship direct to the mint, an equal amount of stamp-mill retort gold is added in the melt, by means of which the grade of bullion is raised to meet United States Mint requirements. Eighty-seven per cent of the total gold of the ore is recovered in the stamp-mill.

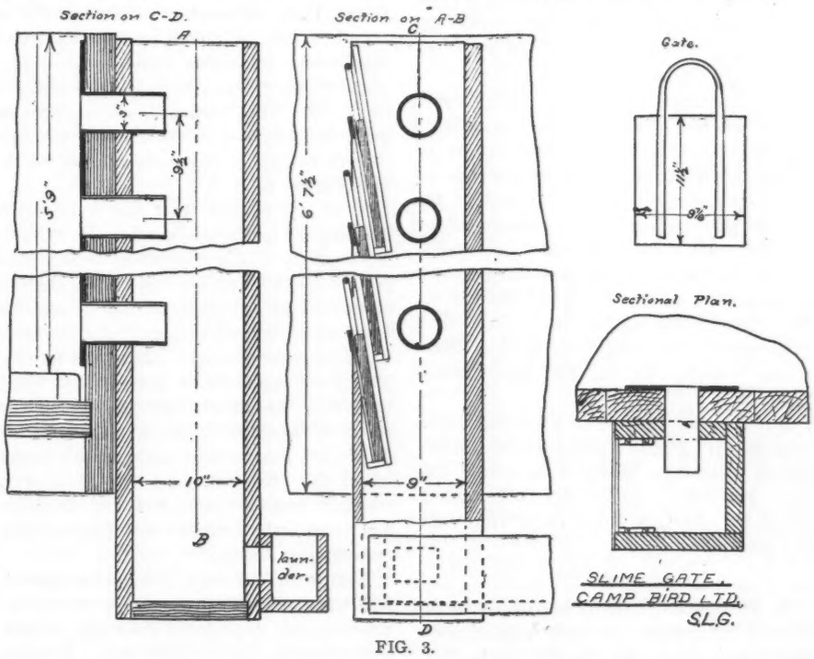


FIG. 3.

## Muntz Metal.*

By John G. A. Rhodin.

An apparatus was specially designed for the purpose of the accurate and rapid determination of the copper content, which should lie between 60.5 and 61.5%. It is necessary to obtain results within 12 hours of the time of casting; 100 analyses must be made in 24 hours, with a mean probable error of not over ± 0.1%. An electrolytic method best fits these requirements. The electrodes consist of concentric cylinders of fine platinum gauze, supported by stout framework to insure even current-distribution. The anode rests on a ring at the bottom of the containing vessel, so that the cathode can be easily removed; both electrodes are held in modified Classen stands. The present installation consists of 30 such unit-cells, and current is obtained from six pairs of accumulators, each of which supplies current to five pairs of electrodes, through suitable nickeline resistance.

One gram (dissolved in nitric acid) is used for an analysis; either 0.5 or 2.0 amp. is employed for deposition. In the former case, deposition is complete in 12 to 15 hours; in the latter, in three hours. Electrolysis proceeds in three phases: (1) Copper deposition and ammoniacal reduction of nitric acid; (2) ammoniacal reduction only; (3) deposition of zinc. A perfect separation takes place if phase (2) occupies a long time and is unaccompanied by metal deposition. If impurities, as arsenic or nickel, be present, they must be removed. These analyses serve as an infallible guide to the casters, so that remelting is rarely necessary.

*Abstract from a paper read before the Institution of Electrical Engineers, London, January 30, 1905.

In conclusion, the author discusses the electro-chemical properties of Muntz metal, which is largely used as a sheathing to protect ship-bottoms from mollusca and algæ. To be effective, it should dissolve in sea-water just to that extent which renders the surface poisonous, the best condition being that which secures equal solution of the copper and zinc. The author shows how this may be calculated approximately, by supposing that the electrolytic solution-rate is proportional both to the heat of formation of the ultimate compounds (zinc and cuprous chlorides), and also to the conductivities of the metals. Assuming that both chlorides of copper are formed, and taking the mean of the results in the two cases, the best values are found to be 60.811% of copper, and 39.189% of zinc, numbers which agree closely with practical experience. The author finds that a binary alloy, like Muntz metal, dissolves slowly at first; the velocity then quickly arrives at a maximum, then it falls suddenly, remaining almost constant for some time, and finally a further variable fall occurs. During the period of constant velocity, the surface must alter as the resistance capacity, if the action is galvanic. The seat of e. m. f. must be in the electrolyte, as the constancy of action indicates a steady e. m. f. of considerable magnitude. It is probable that the result is influenced by the actual mass of metal present, relative to that of the solvent. The external pressure certainly exercises a very considerable effect on the reaction-velocity, by influencing the speed with which hydrogen can leave the surface of the metal.

In discussion, Professor Huntington asked whether the author had considered the question of the best composition of Muntz metal from the point of view of the constituents of the alloy, and of the critical points of the various combinations formed. He drew attention to the work of E. S. Shepherd on this subject, and showed the curves he had obtained in his study of the copper-zinc series. The presence of the compound, $Cu_2Zn$, determines whether or not the alloy would roll hot.

Mr. Rhodin, replying to Professor Huntington, said that certain impurities determined whether a Muntz alloy would roll hot. An alloy containing 70% copper could be rolled, if these impurities were not present.

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A 'pertinacious' current, as defined by Sir Oliver Lodge, is a continuous unidirectional discharge of electricity, produced without cells, and of an e. m. f. so great that resistance, large in ordinary estimate, is easily overcome. Such a current was produced by the magnetic (induction) method in the study of fog dispersion by high-tension discharge. A mercury rectifier is used as a reservoir to trap the surges from an induction coil.

## Tin in California.

By H. E. West.

Reference is so often made to the tin mines of Temescal, in southern California, commonly known as the San Jacinto tin mines, that it may be of service to give a brief description of the work attempted there to date, with the results.

Generally speaking, these deposits have experienced two periods of activity—the latter from 1889 to 1892, and the former some twenty years previous. During the former period some serious development work was accomplished, but this was confined to the Cojalco lode; no attempts were made to extract the ore, however, until the later period. The earlier exploratory work was effected by American capital; and, after an interval of inactivity, the property was floated in London under the name of the San Jacinto Tin Mining Company.

The San Jacinto estate proper is an old Spanish grant, comprising 40,000 acres, lying immediately south of the Riverside orange belt. On this property, within a few miles, there are no less than 70 tin lodes, or, more correctly speaking, lodes that give the appearance of being stanniferous. Of this immense vein system there was but one at all developed, which was the Cojalco lode, situated toward the center of the belt. It is a remarkable fact that no stream tin was found either on the estate or in its immediate vicinity; this is perhaps not so surprising when it is stated that, although I vanned many a sample from the numerous massive lodes that stood on either hand, yet, almost without exception, none was found to carry tin. The 'blow-out,' called the Cojalco hill, an extension of the vein, although tested by cross-cuts, furnished no evidence of tin.

It is just possible that the well-known leaching of the upper portion of lodes is explanatory of this deficiency, as is exemplified in all metalliferous mines, that of tin not being excepted, as may be learned from some Cornish mines, where the tin—together with iron and other metallic sulphides—is supposed to have been leached out from the upper portions, leaving the so-called 'gozzans'; although in that locality copper was the first metal usually found under the 'iron hat.' Be that as it may, the fact remains as stated; nor is there any noteworthy evidence in support of this extenuating theory.

The prevailing rock is a white-colored, acidic granite with the coarsely crystalline habit usually considered favorable, if not indispensable, to tin occurrence. Porphyritic rocks and others of igneous origin exist, but there is an utter absence of sedimentaries, such as the 'killas' or slate of Cornwall, at or near the contact of which with the granite some of the richest deposits occur.

The intention was to cross-cut this immense vein system with an adit, giving in places fully 1,000-ft. backs, the adit to be started in the cañon, about two miles distant from the development work on the Cojalco lode. At the mouth of the adit was to be situated the mill, to consist of six pneumatic stamps, with a capacity of 100 tons per 24 hours. The reduction works were to be operated by water power, a reservoir being constructed about one mile up the cañon, impounding the water by a substantial dam. For this decidedly onerous undertaking the munificent working capital of some $100,000 was provided. The reduction works and dam were started, but, when only partially completed, through shortage of funds were stopped, and finally abandoned. With fresh capital and a change of management another start was made, and the reduction works were erected near the mine.

In the year 1890 a small experimental 5-stamp mill was erected at the mine, with concentrators of varied type, and also a small reverberatory furnace, with hearth 9 ft. by 6 ft., designed for the burning of crude petroleum. This plant gave satisfactory results, and was serviceable for experimental purposes. In the latter part of the same year two of the pneumatic stamps started crushing. By this time the mine had been sufficiently developed to yield the 20 to 25 tons being crushed per day, and the reserves were increasing, so that early in 1891 two stamps were added, thus increasing the output to from 40 to 50 tons per day. Unfortunately, the lode, although comparatively shallow as yet, did not continue to yield the grade of ore obtained nearer the surface; this, in the shoots, carried about 5% black tin. At the 300-ft. level the lode, although still of considerable width, was found to contain little or no tin.

There were reports, after this period, of the lode having bottomed on a 'flat floor,' but I know nothing positively of any such occurrence. Even with such impoverishment at a shallow depth, this is not by itself condemnatory, as long as the vein itself holds, for an impoverished zone is not unknown in metal mining, nor, for the matter of that, in tin mining; for example, the almost hopeless case of Dolcoath, when the copper gave out, and before paying quantities of tin were encountered by deeper development. During the year 1892, and under its third management, active operations were abandoned and the mine shut down. So ended the first actual effort to make these mines productive.

Referring to the Cojalco vein itself, it has a strike roughly east and west, with dip 70° north, and it is of the fissure type. The tin occurred, of course, in the form of oxide, or 'cassiterite.' In the upper portion of the mine the occurrence was mostly in the form of 'ruby tin'—that is, with the color of the ruby or garnet, and at times somewhat coarsely crystalline; at a slightly lower horizon the occurrence was micro-crystalline and of a light color.

The matrix was usually a blue-black, semi-amorphous mass; where soft, largely composed of tourmaline and chlorite products. The ore was singularly free from objectionable accessory minerals, so that separation of the tin oxide was a matter of no great difficulty; nor was there ever occasion to subject the ore to calcination at any stage of the process, as the mispickel, or arseno-pyrite, although present, was not in sufficient quantity to necessitate this additional and somewhat expensive process.

The ore was of medium hardness; the two pneumatic stamps crushed about 25 to 30 tons per day, through a 30-mesh screen, without previous reduction in a breaker. In concentration, the usual Cornish buddle process, necessitating a large amount of labor, was supplanted by vanners of divers types and makes; of those tried, the Frue vanner proved the most satisfactory. It is interesting to note that this was the first practical introduction of the Frue, Woodbury and other vanners to the concentration of tin ore, although this precedent has since been followed at Dolcoath mine, in Cornwall, also with favorable results. The process was a single concentration, without classification; the tailing going to waste, although it is doubtful whether the extraction exceeded 70%. A quantity of cassiterite was carried over, especially at either corner of the flange, where the loss was constant and seemingly irreparable. It may be noted, in passing, that tin ore is an extremely difficult material to recover from its gangue—that is, to obtain a high percentage of extraction, as the cassiterite crystals are easily frangible, reducing to the finest powder, which floats, for the greater part, on the surface of the water.

The 'heads' were treated in a square buddle, and then 'kieved,' as is the usual Cornish practice.

It is doubtful whether the concentrate carried in excess of 55% metallic tin; Cornish 'black tin' is usually dressed to 60 to 65% metallic tin. In smelting with crude oil sprayed by superheated steam, the reduction was effected in about six hours; the charge was a ton of cassiterite mixed with a suitable quantity of reducing culm, or small anthracite. The substitution of oil for coal in tin smelting was perfectly satisfactory, and, doubtless, in that locality, cheaper than coal of a suitable grade.

The metallic tin was tapped into an iron kettle, separately heated, and, after skimming, ladled into pigs for the market. No serious attempts were made at refining the metal; consequently, the grade was below the standard of Straits tin, or good Cornish. This feature, however, is subject to improvement, as the quality of the metal depends largely on the care exercised in its purification. Most of the product was bought by the canneries for soldering purposes.

Probably about 7,000 tons of ore were milled, which, taking 2% as actually saved, would give about 250 tons of concentrate, or, in the usual parlance, 'black tin' carrying about 55% metallic tin. In smelting, practically 50% would be returned as metallic, giving the output of the mines to date at about 100 to 125 tons of black tin. These figures are indicative of the measure of success attained.

Looking backward at the enterprise as a whole, it admittedly presented features of marked promise, which, on the other hand, did not receive substantial support from the developments. In the first place the whole district, geologically and petrologically considered, is admittedly favorable to tin occurrence. There are a number of well-marked and strong lodes, any and all of which might be supposed tin-bearing from the fact that one of its number was rich in tin, at least in the exposed upper workings. The natural advantages for economic working by the proposed adit are obvious. Water existed in fair quantity in the cañon, and crude petroleum can be delivered at a cheap rate to the mine, which would undoubtedly have had a branch railroad from the Southern Pacific, whose main line is not far distant.

Taking a retrospective glance, the most interesting features in connection with these deposits are:

1. The occurrence of tin in California.
2. The production of marketable tin, which, by further refining, would probably equal the average imported grade.
3. The first introduction of pneumatic stamps into California; and, incidentally, probably the construction of solid stone foundations and mortar-blocks for the first time there also.
4. The use and first practical demonstration of the serviceability of the Frue and other vanners, in the separation of cassiterite from its gangue, thus obviating the very laborious buddle process, the use of which the high rate of wages would not permit; and, incidentally, the evolution of the first 6-ft. Frue vanner.
5. The smelting of tin oxide for the first time in a reverberatory furnace by the use of the steam-oil spray from crude petroleum.
6. The influence, politically, which this mine exercised at that period, in reference to the tariff on tin plate.

These features will make this deposit interesting to all mining men, especially those connected with the mining or smelting of tin ores.

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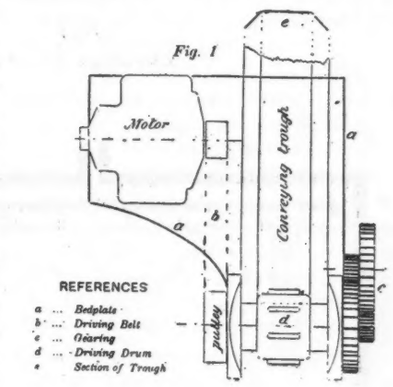
Requirements of a good refractory material for high temperature furnaces are: (1) It should be a poor conductor of heat; (2) it must be mechanically strong over a wide range of temperatures; (3) it must stand the reducing action of the charge, particularly of carbon; (4) if used in an electric furnace, it must be a non-conductor, even at high temperatures.

## Coal Conveyors in Longwall Working.*

By Harry Palmer.

A new underground conveying system, which was placed upon the market some twelve months ago, in that short time has quite revolutionized some ideas of longwall working in thin seams—at all events, in the north of England. The idea of carrying the coal along the face of longwall workings by means of a conveyor never seems to have been considered seriously until Mr. Claghorn, in America, and Mr. Blackett, in England, designed the

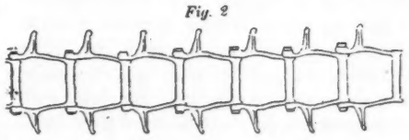
Fig. 1




machinery. Previously gateways had to be made from 30 to 45 ft. apart, whereas the conveyor requires only one main gateway for a distance of from 150 to 300 ft. of face, thus saving stonework and hand putting—two very expensive items in the working of thin seams.

The conveyor is made up of units 6 ft. long, so that it can be shortened or lengthened at will. These units take the form

Fig. 2



of sheet-iron troughs, 6 in. deep, the extreme height of which is 12 in. from the ground; they are supported and joined together by stands made of angle iron bent into the required shape, and fastened to the troughs by bolts and fish-plates. The whole is braced together by angles running along on either side of the troughs, and bolted on to the stands. Recently a great improvement has been introduced in which the trough is fitted with four horns on the under side, which fit into sockets in the angles which run on either side, as in the old pattern; thus the troughs are quite independent and can be lifted out when required. Along the bottom of these troughs runs the upper half of an endless chain, composed of separate links 6 in. long, the construction of which is shown in Fig. 2. If one of these links is broken it can be detached from the rest of the chain by taking out a bolt, and a new link

*Abstract of paper in the *Journal* of the British Society of Mining Students.

easily substituted. The chain is driven by a toothed drum at the motor end of the conveyor and returns below the troughs to a tumbler at the other end. In order to stand the strains to which it is subjected it is made of malleable cast iron. It is this chain which conveys the coal; large lumps rest on top of it, and small coal is scraped along the bottom. The chain runs on no rollers or bearings, but the small coal acts as a sort of lubricant, and the conveyor overhangs the bank, so as to deliver into tubs placed below in the mother-gate.

In the case under consideration the conveyor is on a left-hand face, and the coal is delivered on to a main gateway or mother-gate, which is kept some yards in advance of the face for the purpose of obtaining siding room. This mother-gate is made 6 ft. in clear height by taking up about 4 ft. of bottom (the seam being about 2 ft.), and is driven wide enough for two roads, one for full and the other for empty cars. On the right-hand side the coal is left solid, the idea being to bring it back by means of the same gateway, with the conveyor, after the present face has gone up a certain distance. The face is about 220 ft. long, and on the far side a gateway is kept up as an air road and for a second road out. The timber is sent along this gateway and put on the conveyor, so that it can be taken off at any desired part of the face. This saves dragging it along by hand. Fig. 3 and 4 show a plan and elevation of the face and conveyor; *a* represents the motor, *b* the driving drum and gearing, *c* the tubs on the mother-gate, *d* hardwood chocks, and *e* the return tumbler. The seam is the Three-quarter, with a section of about 20 in.—the face advancing toward the west in a bordways direction, and rising about 1 in. in 3 ft. The coal is soft and does not require much hewing, no shooting being required, therefore mechanical coal-cutters are not suitable, although a Morgan-Gardner chain machine has been tried in the seam. The coal is therefore got by pick mining.

Fig. 3
Elevation on A-B

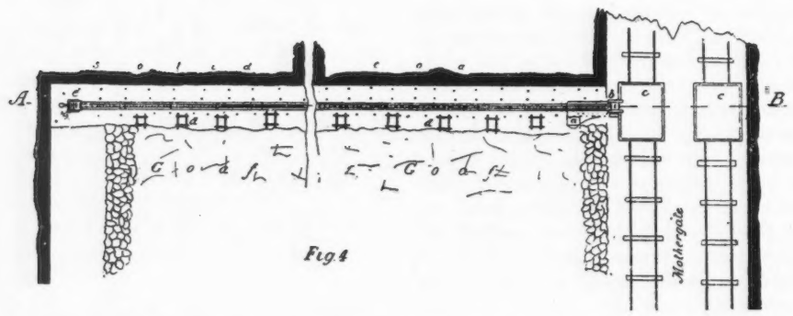



Fig. 4

friction is not so great as might be expected.

The motive power at Derwent colliery is obtained from an electric motor placed at the delivery end of the conveyor. The motor is fixed upon a bed-plate *a a* Fig. 1, which also carries the gearing and the last 6 ft. of troughs. The motor is wound for 180 volts, and absorbs about 30 ampères, equivalent to slightly over 7 horsepower. It gets its power from a dynamo at bank. Its greatest height is only 18 in., while the bed-plate is about 6 ft. wide by 4 ft. square. The machinery is supplied complete, with all accessories, by the Improved Coal Mining Company, of Sacriston, Durham. Mr. W. C. Blackett, mining engineer, of Sacriston, is the patentee.

The conveyor was originally driven by a flat leather belt, *b*, Fig. 1, and this arrangement had the advantage that when the conveyor was overloaded the belt would slip and save any damage being done to the motor; but after a few weeks' trial it was found to slip too much, so the usual Hans Renold chain drive was reverted to, with excellent results. As there is no slip on a chain drive, a copper shearing-pin device is used, so that the pin will shear when more than a certain load is on, and also provide a mechanical cut-out for the momentum of the armature in case of a sudden jam. Referring to Fig. 1, the belt or chain *b* actuates the driving drum *d* through the 14 to 1 gearing, *c*. This gearing is made of cast steel, which is enclosed, and runs in a bath of Stauffer lubricant, which is found to deaden any noise from the gearing, as well as lubricate. The delivery or motor end of the

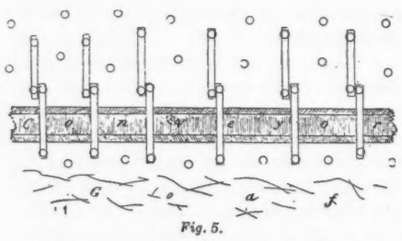


Fig. 5.

course, depends on how far the face has advanced during the shift. It is undesirable that the face should be allowed to get more than about 7 ft. away from the conveyor, as in that case, of course, casting becomes more difficult. The operation of moving over is performed without breaking any joints in the troughs except on very long lengths, when a quickly detachable joint may be fitted about the middle of the conveyor. The machine is moved up by attaching Sylvester's prop-drawers (generally two), beginning at one end and making a slight bend in the conveyor. There is sufficient play at the joints to allow of this. The bending process is followed up all along until the whole conveyor is in line again, when the operation is repeated until the required distance is reached. This work is done by five men, at a fixed wage, during the night shift.

The original system of timbering was to have two rows of props and planks at right angles to the face; the plank ends overlapped in the middle for a few inches, as shown in Fig. 5. When moving the conveyor up after the day's work the middle props had to be knocked out to enable the conveyor to come up to its new position. The roof is a strong 'post' or sandstone, and forms an ideal top under ordinary conditions, but knocking this timber out on such a long face caused the roof to 'weight' and bend down towards the goaf, the consequence being that one day part of the face was almost completely closed, the roof bending down on the troughs and holding them tight for a distance of 105 ft. A good deal of work had to be done to get the conveyor released, a few troughs being left in, as it was cheaper to sacrifice them. The hewers had to skirt along the fallen part in the coal, with a headway lift, and a new face was by that means opened out. Profiting by this experience, it was decided to adopt a different direction of face and method of timbering. The new face was set away at an angle of about 10° to the cleavage, and was reduced to about 150 ft. in length, which has been gradually increased until the face is now 220 ft. long. Hardwood chocks were set next the goaf at a distance of about 6 ft. apart, and planks dispensed with, only props and lids being used. This has answered admirably, no trouble with the roof having been experienced since this method was adopted. At present 20 hewers are engaged in the day, 10 in each shift. Other hands concerned are two deputies, five men moving over, two stonemen, one lad attending motor, and two drivers.

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If we consider simply the time taken to travel personally, neglecting the other methods of communication, in which much greater speed has been attained, every part of the country has now become nearer the most distant section than Boston was to Richmond one hundred years ago; this is what the railroad has done.

## Books Reviewed.

*Architects' and Engineers' Handbook of Reinforced Concrete Constructions.* By L. J. Mensch, Chicago, Illinois; *Cement and Engineering News.* Pages, 211; illustrated. Price, $2.

This handbook contains a short, well-illustrated story of the properties and use of cement in the building of bridges, walls, floors, columns, piers, towers, etc. The treatment is popular rather than technical.

*Production and Use of Petroleum in California. Bulletin No. 32.* By Paul W. Prutzman. Prepared under the direction of the State Mining Bureau. Lewis E. Aubury, State Mineralogist. Sacramento, California; State Printing Office. Pages, 232; with maps and illustrations.

This bulletin contains a plain, popular description, well illustrated and indexed, of mineral oil in this Pacific State. A large part of the pamphlet is devoted to the use of oil as a fuel, and in treating roads. This is Bulletin No. 32 of the California State Mining Bureau, an organization whose publications are of timely and permanent value.

*Plane and Spherical Trigonometry.* By P. A. Lambert and H. A. Foering. New York; The Macmillan Company. London; Macmillan & Company, Ltd. Pages, 104; with diagrams. Price, 60c.

This is a short, clear, concise statement of the standard principles of the science, so shaped as to make the student think out the relations of trigonometric functions, and apply them for himself. To this end no answers are given with the problems; and the customary tables of sines, logarithms, etc., are omitted. Otherwise, there is nothing particularly original about the editing of the book, except that the general plan is a part of that common sense which is always original. For a small book, it is very large—in scope.

*Die Neueste Entwicklung der Wasserhaltung.* By Professor Baum. Assisted by Doctor Hoffman. Berlin, Germany; Julius Springer. Pages, 116; illustrated. Price (in New York), $1.40.

This is a series of reprints from 1904 issues of the mining and metallurgical journal, *Glückauf.* The substance of the folio concerns the construction and efficiency of some of the principal German makes of pumps, as operated both in service tests and in special tests, at many of the large mining plants. The pumps considered are actuated by the steam-engine (reciprocating and turbine), and by electricity. The treatment involves technical methods without being exclusively theoretical. The folio is accompanied by eight large folding plates, but, unfortunately, is destitute of an index.

*Testing of Electro-Magnetic Machinery and Other Apparatus. Volume I. Direct Currents.* By Bernard Victor Swenson and B. Frankenfield. New York; the Macmillan Company. London; Macmillan & Co., Ltd. Pages, 420; illustrated. Price, $3.50.

This is a practical consideration of the subject in hand, by the method of 96 detailed experiments. These tests involve, not only the determination of the quality or quantity in the external object or machine, but also the testing and calibration of the measuring instruments themselves. As Mr. Swenson is connected with the University of Wisconsin, and Mr. Frankenfield with the Nernst Lamp Company, the book has a combined value in theory and practice that is unusual. The book is recommended to those who want thorough training with hard work.

*Geological Survey of Alabama. Bulletin No. 8. The Materials and Manufacture of Portland Cement, and the Cement Resources of Alabama.* By Edwin C. Eckel and Eugene A. Smith. Montgomery, Ala.; The Brown Printing Company. Pages, 91; with illustrations and map.

This pamphlet, published as Bulletin No. 8 of the Geological Survey of Alabama, is of that commendable class of educational technical literature designed to stimulate home industry and production. The first part is a disquisition by Mr. Eckel, of the United States Geological Survey, on the nature and use of cement, followed by a well-illustrated description of the Cretaceous and Tertiary lime deposits, which are regarded as suitable for cement manufacture. The work is worthy in every way, and credit is due to the practical views of E. A. Smith, under whose direction the bulletin is issued.

*Les Gisements de Cuivre du Katanga.* By H. Buttgenbach. Liége, Belgium; reprinted from the *Transactions* of the Société Geologique de Belgique. Pages, 52; with maps. *Les Dépots Aurifères du Katanga.* By B. H. Buttgenbach. Bruxelles, Belgium; Hayez. Pamphlet, 13 pages.

These two pamphlets are reprints from the proceedings of the Belgian geological societies. The former describes, geologically, the copper deposits of Katanga, which is in the extreme southern part of the Congo State, and about 200 miles west of Lake Bongweolo, about 11° south latitude. The writer had charge of an expedition which got its information first hand. The ore carries 15% in copper and some silver. The second pamphlet describes more briefly the gold deposits of the same region. The two pamphlets comprise official information on the ore of this equatorial place, which is famed in the local tradition of several centuries as a source of copper.

## Books Received.

In sending books for notices, will publishers for their own sake and that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

*The Vision of Elijah Berl.* By Frank Lewis Nason. Boston; Little, Brown & Co. Pages, 298; illustrated. Price, $1.50.

*The Cumberland Coalfield and Its Creators.* By J. C. Tipton. Middlesborough, Ky.; the American Association, Inc. Pages, 120; illustrated.

*Anuario Prado Martinez. Unica Guia General de Chile.* Compiled by Alberto Prado Martinez. Santiago, Chile; A. P. Martinez. Pages, 1,048; illustrated.

*The Michigan Engineer.* 1905. *Proceedings of the Michigan Engineering Society.* F. Hodgman, Secretary. Climax, Mich.; published by the Society. Pages, 148; illustrated.

*Bulletin No. 9, Engineering Experiment Station, Iowa State College. Notes on Steam Generation with Iowa Coal.* By G. W. Bissell. Ames, Iowa; published by the College. Pamphlet, 16 pages.

*Report of the Commissioner of Education for the Year 1903. Volume I.* William T. Harris, Commissioner. Washington; Government Printing Office. Pages, 1,216.

*Proceedings of the Seventeenth Annual Meeting of the Iowa Engineering Society.* 1905. B. J. Lambert, Secretary. Iowa City, Iowa; published by the Society. Pages, 188; illustrated. Price, 50 cents.

*Statistical Abstract of the United States.* 1904. Prepared by the Bureau of Statistics of the Department of Commerce and Labor. O. P. Austin, Chief of Bureau. Washington; Government Printing Office. Pages, 660.

*The Foreign Commerce and Navigation of the United States for the Year Ending June 30, 1904. Volume I.* Prepared by the Bureau of Statistics of the Department of Commerce and Labor; O. P. Austin, Chief of Bureau. Washington; Government Printing Office. Pages, 1,092.

*United States Commission of Fish and Fisheries. Bulletin No. 566. The Biological Relation of Aquatic Plants to the Substratum.* By Raymond H. Pond. Pages, 44; illustrated. *No. 567. State Ichthyology of Massachusetts.* By Theodore Gill. Washington; Government Printing Office. Pages, 283.

*University of Wisconsin. Bulletin No. 99. The Græcostasis of the Roman Forum and Its Vicinity.* By Charles James O'Connor. Pages, 48; illustrated. *No. 102. An Investigation of Rotations Produced by Current from a Single-phase Alternator.* Pages, 162; illustrated. *No. 108. From the Borderland Between Crystallography and Chemistry.* By Victor Goldschmidt. Pages, 16.

## Correspondence.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.
Letters should be addressed to the Editor.
We do not hold ourselves responsible for the opinions expressed by correspondents.

### *The Simplon Tunnel.*

Sir—The daily press reports, and the host of other general publications, relating to the Simplon tunnel have only one defect—their complete inaccuracy. To understand anything clearly, it is first necessary to banish from the mind those wonderful tales of the newspapers.

At present there are 400 meters to bore in the secondary gallery No. 2. All work is stopped as the result of new inbursts of hot water in the heading of No. 2, Italian side. New installations of pumps are at this moment being finished in a cross-passage near the fourth kilometer in order to deal with the heat due to the inflows of hot water. The pumps are of centrifugal type, quadruple-stage, by Sulzer Brothers, and the Pelton wheel for driving is by Rieter & Co. Their nominal speed will be 1,050 rev. for maximum supply of cold water to the spraying apparatus in the two tunnels, No. 1 and 2, but a much lower speed while using only two of the blades will suffice for present needs. The 100-horsepower steam-engine installed in the same transverse gallery will be kept in reserve.

The cold water for the pumps is taken from a huge spring of cold water which occurs in the previous transverse gallery, nearer to the tunnel's mouth, at Iselle. For a long period this spring supplied water to the headings without any pumping whatever, it having then a head corresponding to 80 lb. per sq. in. at each outlet, and a low temperature, winter and summer alike, of only 11° C. At the present moment the gauge on the main pipe above the pumps indicates an average initial pressure of only 6 kg. per sq. cm., the pumps working as before mentioned. This is unquestionably the most important installation for the work in the tunnel, next, of course, to the ventilation; without it, all further work would have to be abandoned by reason of the heat.

It is curious to observe the extreme difference of temperature in the two tunnels near the fourth kilometer from Iselle. In tunnel No. 1 the air has a temperature of about 30° C. and is densely charged with gases and foul air, while at the same point in tunnel No. 2 the free air, flowing through a tunnel flooded with cold water, blows along with a strong, cold wind toward the headings. Here the whole tunnel is filled with the noise of water bursting through the rock from all sides, restrained in its irruption only by sheeting-boards. At this point the tunnel is bored in solid rock, but it is very heavily timbered.

The water flows rapidly toward the tunnel's mouth (grade 7 in 1,000), and covers the whole floor to the depth of about a foot. Solid planking at sufficient height is laid down for foot-passengers. Forward, at a distance beyond of about four kilometers, the air becomes warmer. In parts, the hot water from the headings is conveyed in drains covered with thick boards, so that the radiation of its heat is almost imperceptible. In other parts it is carried in a large iron pipe, and still nearer to the headings this is replaced by an octagonal wooden pipe or flume. In many places the tunnel floor has been squeezed up by the lateral pressure, and the strongly built masonry of the drain-channel (sometimes in concrete) is almost closed by deformation, while the construction track has assumed an obtuse angle with the tunnel walls. The tunnel here is, of course, heavily timbered, the thick timbers crossing the tunnel diagonally. All this occurs in a granular mica-schist. Except in the limestone, which is comparatively stable, all the tunnel is in course of being riveted with masonry of a strong section and with inverts throughout. The drain-channel in No. 2 heading has yet to be reconstructed throughout a great length. Engineers take this channel as their most useful guide for indicating the parts of the tunnel most subject to pressure.

Further ahead the air becomes hotter, and the whole floor is flooded with warm water that has been mixed with the cold water of the spraying apparatus, etc. In the neighborhood of the sprays matters become worse, and at the last transverse passage the steam arising from the condensation of the vapor against the spraying water is such that it is scarcely possible to see a light a yard in front. Water from hot springs pours through in every direction. Here the miners work in waterproof clothing.

In tunnel No. 1 the heat and steam render work exceedingly difficult and slow. At the point where the first hot springs irrupted last September, the whole heading is sheeted with corrugated galvanized iron. Behind this are heavy lagging and stiff timbering which take up the violence of the inbursting hot water. The same dense fog prevails here, and the tunnel heading resounds with the rush of water against the iron sheeting; except for boots and pants, the miners are almost naked.

This part of the tunnel now being enlarged, under the circumstances just related, is certainly the most difficult—not for the engineering difficulties, as, for instance, in the sludge-like decomposed mica schist, but because of the rapid exhaustion of the miners, who were able to readily support cold water to the waist, but upon whom the heat, in conjunction with the semi-obscurity of the fog produced by it, is very demoralizing; it must also be remembered that the water reaches oftentimes half to the knee, and prevents holes in, or loose objects upon, the tunnel floor from being seen; consequently their movements are slow and the whole work very costly. In the course of the day's work it is not surprising to find miners going to the hospital suffering from terrific blows on the head from the hammers of those working in the enlargement area.

At the point of encounter where the two headings, Swiss and Italian, met, there is now a wooden partition forming an impassable barrier; this keeps the air from Iselle from advancing to Brig. Thus the ventilating system of both sides of the tunnel remains distinct and separate as before the piercing, and the result is better than if the air were driven right through the tunnel. Work still continues at both sides, just as if the heading had not been pierced at all. To overcome the difficulty of hot springs in No. 2, a fresh transverse passage is being driven from near the barricade, in the tunnel No. 1, forward into the line of heading No. 2, which, as soon as reached, will be headed backward to the abandoned point in the tunnel No. 2.

It is anticipated that all work, even to the laying of the track, will be finished in September, if all goes well. A great deal of fresh work has also to be done in the already finished parts of tunnel No. 1, for the lateral crushing effects of the rock have been observed in many places, and now every foot of the tunnel is to be underbuilt with an inverted concrete arch. This work is being carried on in the simplest manner possible without interfering with the heavy traffic through No. 1. This is done by building the inverted arch in a large number of small sections, so short in length that the track itself, without underpinning, bridges each excavation.

CHARLES R. KING.

Iselle, Italy, April 5, 1905.

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COPPERAS IN AGRICULTURE.—Many advantages are claimed for ferrous sulphate, in addition to its good service as an antiseptic agent capable of destroying vegetable parasitic diseases. Too large an application of copperas, however, may be injurious to agricultural land. Experiments have proved that one part sulphate of iron, dissolved in two parts of water, will destroy *Peronospora viticola*, which attacks grape vines; 10 parts sulphate of iron, 10 parts wood ashes and 2 parts coal tar destroy *Phylloxera* and fungi; a 10% solution of sulphate of iron destroys *Phoma vitis* and *Phoma Cookei*, two fungi which affect grape vines in Austria-Hungary; a 50% solution of sulphate of iron in water makes a good wash for vines before shoots start, as will also 4 parts sulphate of iron and 20 parts lime; a 0.2% solution of sulphate of iron destroys vine mildew. It has also been shown that a solution of sulphate of iron will remedy *Chlorosis* in trees and plants generally; and diseases of potatoes, wheat, corn, etc. By increasing the iron oxide and phosphoric acid content of ash, and retaining the ammonia in the soil, sulphate of iron exerts indirect influence for good.